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Hydro news

January/February, 1973

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january / february 1973

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A reproduction of our cover scene may be obtained by writing to National Capital Commission, Information Services, 48 Rideau Street, Ottawa.

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hydro news, volume 60, number 1

Published by Ontario Hydro, 620 University Ave., Toronto.

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Printed in Canada

VIEWPOINT

The year in review

Searching for words to sum up the past year in terms of Hydro leaves us having to settle for "significant" and "eventful". Some of the answers to future trends and direction were forthcoming but the year ended on a series of question marks where many important issues were concerned.

Certainly it was a year of achievement and progress. A record high demand of 21,739,000 kilowatts was experienced December 4. Unseasonably mild weather in January prevented this peak being surpassed, as sometimes happens.

Hydro expects to meet the peak this winter with a reserve of approximately 2,000,000 kilowatts, barring unforeseen circumstances. This is still somewhat below an optimum reserve for a system of this size and particular generation mix, but satisfactory in the light of high water conditions prevailing throughout the various watersheds.

The system's generating capacity was increased by more than 1,000,000 kilowatts in 1972 with the coming into service of two major thermal-electric units, one at Nanticoke G.S. and the other at Pickering N.S. The 500,000-kilowatt Nanticoke unit is the first of eight at this coal-burning plant which will have an ultimate capacity of 4,000,000 kilowatts.

Among the most gratifying of the year's achievements was the successful commissioning of the third, 540,000-kilowatt unit at the Pickering nuclear station. Pickering is regarded as a bellwether nuclear station and its initial performance has confirmed the practicality of the Canadian nuclear concept as an attractive alternative to fossil fuel sources of thermal-electric power.

Additional generating capacity totalling 3 million kilowatts was at various stages of construction at year's end. This construction program is expected to cost in the area of $2.5 billion. Capital expenditures for 1972 are estimated at $524 million and this annual expense is expected to exceed the billion-dollar mark by the late 70's.

The report of the Solandt Commission towards the end of the year further underlined the growing problem of gaining public acceptance for Hydro developments impinging on the environment. As a result of this government-sponsored inquiry, Hydro has been required to postpone construction of part of the vital EHV transmission line from Nanticoke to Pickering for further route study.

Top priority has been given to working out ways and means of developing effective public participation in the planning process for new lines and stations.

The most obvious measures Hydro can take in gaining public support, of course, are physical innovations which reduce the environmental impact of its projects. A number of programs under way include research into sulphur removal from flue gases, effects of warm water discharges on lakes, high-voltage underground transmission, the use of alternate fuels and ways of improving the appearance of overhead transmission lines.

Overshadowing all this progress and certainly the most traumatic of the year's developments was the strike by some 12,000 members of CUPE Local 1000 which stretched from the end of June to mid-October. At year's end, the issues in dispute remained unresolved and were being considered by a three-man arbitration board whose decisions will be binding.

Another area where many important questions remained unanswered at year-end involves Task Force Hydro. The task force was appointed by the Government of Ontario to review the function, structure, operation, financing and objectives of Hydro and its first report, "A Future Role and Place," was made public in November.

This wide-ranging report included 32 recommendations dealing primarily with the Hydro mandate and the Hydro-government-public relationship.

Premier Davis has indicated acceptance of the recommendations establishing Ontario Hydro as a Crown Corporation with a board of directors headed by a chairman. He has withheld comment on the remaining recommendations to avoid prejudicing forthcoming reports by the task force on Hydro organization, power costing and rates philosophy, external financing and 'make or buy' policy.

Since the report was made public, the Ontario Municipal Electric Association, representing the electrical distribution utilities in the province, has gone on record as opposing many of the changes recommended by the task force on the grounds that they would result in unjustified rate increases, restrict access and make Hydro less responsive to the wishes and requirements of the people.

Also awaited with great interest as the new year began was the report of the Advisory Committee on Energy. Established by the Ontario Government to determine the province's future energy requirements and supplies, and to recommend ways and means to ensure that they are met, the Committee's findings are expected to establish important guidelines in shaping future Hydro policy.

The new year is likely to provide many of the answers in these policy areas and shapes up as one of the most challenging in Hydro's history. Looking farther into the future, electricity seems destined to play a role of even greater importance in the continuing progress of this province. Coping with change in bringing this to fruition is the long-term challenge facing Hydro and its people. □

Lennox: a crucible for new techniques

by Les Dobson



small group of Ontario Hydro engineers ent two weeks in Japan last year visit- g the Tokyo Electric and Kansai Electric ilities and several major manufacturers. heir mission was to learn more about the oblems of burning both crude and sidual fuel oil to produce electricity.

The Hydro delegation included Glen tterson, station manager of the Lennox -fired plant now taking shape on the ke Ontario shoreline near Kingston. r. Patterson's primary interest was the eration and maintenance of crude-oil wer plants. Lennox, the province's first -fired power station, will have the pability of switching from burning con- ntional residual oil to more volatile ude without so much as even a pause generation.

Crude oil is just what the term implies – w oil straight from the well. Residual is the heavy oil that's left after gasoline d other products have been removed ring the refining process.

"Having the ability to switch from one m of oil to another makes us less lnerable to market conditions, and also ves us flexibility in pollution control," ys Mr. Patterson. "Some crude, for ample Alberta oil, is particularly low in lphur content."

Japanese utilities pioneered the burning crude oil in power plants, and have re than 10 years' experience in this ld. They have a number of large gen- ating units in operation, ranging in size to 600 megawatts.

"Although we were on the lookout for usual problems, operating conditions dn't seem so different from our own. Of urse, the Japanese realize they are aling with a volatile fuel and are taking sonable precautions," Mr. Patterson ds. "They have to be particularly careful nen blending crude and heavy oils dur- the transition period because crude burns at a lower temperature than idual."

Lennox is due to produce first power xt year. Completion of its fourth 575- gawatt unit is scheduled for 1977. the initial stages, the plant will burn idual oil only.

n some ways, Lennox is an exception



Glen Patterson..."choice of oils makes us less vulnerable." Left: view from top of Lennox stack shows foundations for oil storage tanks.

to the usual flow of technology from the United States into Canada. In the case of burning crude oil, for example, the technology is being imported from Japan while U.S. utilities are only at a parallel stage of development with those in Canada. Moreover, another imported technique being introduced at Lennox – that of low excess air firing – is relatively new to the U.S.

On the theory that large amounts of air will have little or no harmful effect and will ensure there is sufficient oxygen for complete combustion under all conditions, most fossil-fuel steam plants on this continent operate with volumes of air well in excess of those necessary.

The amount of air drawn into boilers may exceed combustion requirements by up to 30 per cent in oil or gas-fired units, and by even more in coal-fired plants.

Quite by accident, a group of West German engineers experimenting with an oil burner and impeller in 1952 proved the old theories wrong. An impeller fell

scous nature of residual oil is illustrated amatically at Ontario Hydro's research boratories. As the name suggests, residual is the substance left after gasoline and her products have been removed during e refining process. Before being burned as a el at Lennox, residual oil will be heated to 40 degrees to help it flow. Below: aerial ew of the Lennox site.



o the furnace during the tests, reducing e amount of excess air. Instead of teriorating, there was a significant im-ovement in combustion.

Since that time, low excess air firing chniques have been widely developed Europe and are now being introduced o North America. Two 107-megawatt v excess air oil-fired units are operating Courtenay Bay generating station in w Brunswick and two 150-megawatt its at Holyrood generating station in wfoundland.

While the new technique has only ited application in coal-fired units, it lds a substantial bonus when it comes oil-fired plants. The rewards are in-ased thermal efficiency, decreased intenance costs and a reduction in lutants, particularly in the formation of phur trioxide. Maximum benefits are rived when the air-fuel ratio to indi-ual burners is exact for all load condi-ns, a fact calling for more sophisticated ntrols than in conventional stations.

Hydro has already announced the arding of a contract to Golden Eagle nada Ltd. for the supply of 25 million rels of residual oil, which should carry station through the commissioning ges and into 1976. The contract is rth between $70 million and $75 lion.

Golden Eagle Canada will produce the dual oil from Venezuelan and Libyan de at its refinery in St. Romuald, on south shore of the St. Lawrence River posite Quebec City. The oil will be ved by unit train from the refinery to Lennox plant. Crude oil, which will be used before late 1975, will prob-y be delivered to Lennox by pipeline.

Lennox's fuel handling system will be able of unloading a unit train carrying proximately 40,000 barrels of residual in under four hours. Trains will move wly over a concrete unloading pit into ich the contents of each tank car will dumped. From there, the oil will be mped either to the main storage tanks o day tanks in the powerhouse area.

esidual oil will be stored in two main ks, each capable of holding 833,000 rels. Crude oil will be stored in a third tank of similar capacity. All three tanks will be 360 feet in diameter and 48 feet high. Environmental precautions include the building of dykes to contain all the oil should a serious leak develop.

Each tank will hold 40,000 barrels of either residual or crude oil. To assist the flow of oil into the plant, residual will be heated to 140 degrees and crude oil maintained around room temperature.

According to Arvo Niitenberg, Lennox's manager of engineering, one of the first decisions about the station was whether it would be fossil-fuelled or nuclear. A nuclear plant was ruled out, partly because of the need for more peaking capacity. Conventional thermal stations are more suitable for meeting peaks in electrical demand.

Another consideration was the economic climate in 1968, the time the decision was made. A fossil fuel station costs about half as much to build as a nuclear plant of similar capacity.

Having opted for a conventional thermal station, the planners then turned their attention to alternative fuels. A study comparing coal, oil and gas is normally undertaken early in the planning of every fossil-fuel plant since their cost and availability have an important economic bearing on the operation of the station.

Two studies were prepared, one by Hydro's own engineering staff and the other by a firm of outside consultants. Both agreed there were economic advantages to building an oil-fired station. But the consultants' report, which was somewhat less conservative, estimated capital cost savings of up to $20 million and a reduction in operating and maintenance costs of another $2.3 million over the economic life of the plant.

Add to this the effectiveness of low excess air firing in reducing air pollution, and the fact that oil yields substantially less fly ash than coal, and the decision to go for an oil-fired station at Lennox appears to have a number of important pluses. □

ROMANCE ON THE RIDEAU

by Bill Settatree

When Ottawa became the first community on the continent to launch a city-wide street lighting program in 1885, a clause in the contract stipulated the lights should not be turned on when the moon was shining brightly.

That decision was more for economy than romance since electricity, in the beginning, was expensive. But in the long run, romance won out.

Driving along Ottawa's scenic parkways on a moonlit night in 1972, you might still think the streetlights were turned off. Much to the delight of necking couples, lights are few and far between and the old-fashioned but attractive globe-type fixtures predominate.

Even in Confederation Square, in the heart of downtown Ottawa, the multi-million-dollar National Arts Centre is a darkened bastion in the evenings.

This empathy for gloom is manifest in the policy of the National Capital Commission, the government agency responsible for administering government lands in and around the capital. "NCC policy is for very subdued lighting," says Lloyd Askwith, general manager of Ottawa Hydro. "In fact, if it wasn't for security, many of the parkways would likely have no lighting at all."

To Mr. Askwith, it's just one of the special problems he's encountered in more than 20 years with the utility and particularly since he became manager in 1970. After all, his biggest customer is Canada itself – or, at least, the organization which governs it.

The federal government's power bill in the capital came to more than $4 million last year and accounted for 17 per cent of Ottawa Hydro's total load. And these figures exclude government offices in rented buildings, where the landlord pays the utility.

In most cases, power is fed into distribution systems built by the Department of Public Works. It then becomes the department's responsibility to serve the various buildings in a government complex. One such development is Confederation Heights, which houses CBC headquarters and the Taxation Data Centre among others. Confederation Heights has a peak load of more than 9,000 kilowatts and foots an electricity bill that exceeds $500,000 annually.

The Dominion Experimental Farm has a 4,700-kilowatt load while Parliament Hill itself has a requirement of almost 3,000 kilowatts.



Rideau Canal as it flows past the National Arts Centre.

It's romantic all right. But subdued lighting poses some special problems for Ottawa Hydro

But Ottawa is far more than a bureaucratic monster gobbling up the kilowatts. The national capital's planners are busy turning the city into a "people place" interlaced with pedestrian malls, bicycle paths, skating surfaces and even garden plots for the cliff dwellers who populate the growing number of high-rises. And in a people place, the word is to keep the lights down low.

R. D. Clack, assistant general manager of the National Capital Commission, says his organization is concerned with lighting decisions made by Ottawa Hydro and in many cases will contribute toward the increased cost of special installations.

"Highway luminaires are not appropriate in the cultural centre and are equally out of place in some other places," he says.

All of which adds to the problems of Ottawa Hydro, which like most utilities has adopted a standard form of lighting. Maintenance is less of a headache with standardized installations while replacement parts are easier to obtain.

Nevertheless, the NCC is prepared to delve into the coffers to get what it wants. With the rebuilding of the Mackenzie King Bridge, which spans the Rideau Canal near Confederation Square, the utility planned on installing modern roadway-type lighting. NCC felt this would be out of keeping with the architecture of the National Arts Centre nearby, and agreed to pay the difference in cost between roadway lighting and the old-fashioned, globe-type fixtures eventually installed.

Under chairman Douglas Fullerton, the NCC has assumed a new vitality in recent years. In Ottawa, the emphasis on the environment is perhaps greater than in any other Canadian city. The NCC's objectives, set out in 1969, are "to make the capital region a fitting symbol of Canada's cultural and linguistic values and an efficient and aesthetically satisfying place in which to carry on the nation's business. . . ."

The NCC reports to the Minister of Urban Affairs and it is hoped the work in the Ottawa area will establish guidelines for other urban centres.

Fullerton bubbles enthusiasm when he talks about the 1,800 square miles under his jurisdiction. NCC decisions affect about 600,000 persons and 57 municipalities in both Ontario and Quebec. Yet some of his ideas have met strong opposition from



cling the "in" thing.



The Sparks street mall.

municipal officials.

"It's one of the hardest things in the world to get officialdom to try something new. People are so afraid of failure, or of looking foolish," he told Hydro News.

Public skating on the Rideau Canal raised the hackles of skeptics because it was tried 20 years ago and flopped. However, the NCC persisted with the plan and now more than three miles of ice are reserved for skaters each winter. Some portions are illuminated and skating chalets dot the shoreline. Plans are underway to heat the chalets with infra-red electric heaters.

Mr. Fullerton, who skated to the office several times last season, estimates that 550,000 skaters used the facilities in 1971.

Bicycle paths, almost 50 miles of them, are proving immensely popular and the NCC hopes to expand the system. The number of trails from which riders can get an appreciation of the natural beauty of the capital has kept pace with the rise of the bicycle fad. The paths touch all major residential areas so that many commuters now use them to cycle to and from work.

The NCC last year embarked on a program to assist amateur gardeners. Garden plots on prime crown land were offered at $10 a season. The demand was so great that the program was expanded. Tenants were mainly green-fingered apartment dwellers or homeowners with small backyards.

One important area involving both NCC and Ottawa Hydro officials is urban renewal. Underground electrical distribution is heavily favored in any renewal project and the NCC has heavy financial commitments to this end.

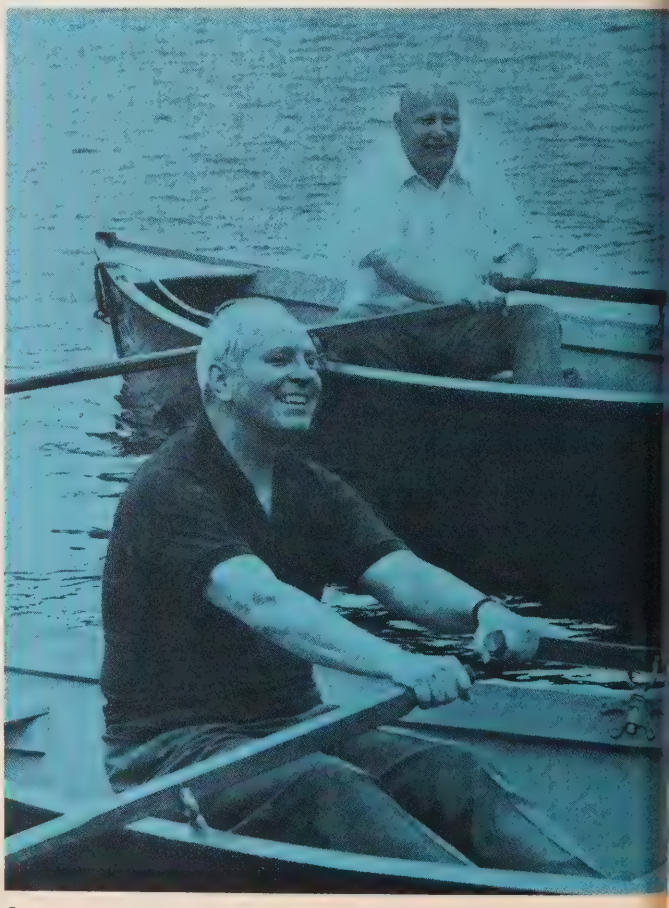
"Underground is a desirable goal," says Mr. Fullerton. "We want as many wires as possible buried. We've started with low-voltage and, when it's economically feasible, we'll bury the high-voltage transmission lines, too."

Since 1968, the NCC has contributed $384,000 to underground installations in the city, exclusive of work done on its own property by the Department of Public Works. Fullerton hopes to see the city's entire distribution system placed underground eventually. He says grants will be made available whenever possible in areas where the government has special interest.

Underground distribution is by no means new to the nation's capital. Way back in 1898, the Deschenes Electric Company



Subdued lighting around the Parliament Buildings.



Out rowing...NCC chairman Douglas Fullerton with Urban Affairs Minister Ron Basford.

ccessfully laid cable under the Ottawa ver from Hull to Ottawa to light the ussell House Hotel. Since then, there have en various underground projects and tawa Hydro can boast that cable installed 1923 still remains in use today.

In those early days, the installation of derground lines was prompted more by ace considerations than by aesthetics. ith several private power companies com- ting with one another, certain areas came a hopeless "wirescape" and some es just had to go underground.

With the Second World War out of the ay, the underground program was accel- ated and Ottawa Hydro is spending about .5 million annually, installing three times much distribution system underground overhead. Federal involvement relates mainly to the city's central core where government properties predominate.

One major project involves the removal of overhead lines around Ottawa University as part of a program to incorporate surrounding streets and university buildings into a single park-like campus. The underground system will be owned by the university with Ottawa Hydro providing electrical service to a central point.

The city's first sputtering arc lights drew their power from a small generating station owned by the Ottawa Electric Light Company at Chaudiere Falls, on the Ottawa River.

Times have changed since the crowds gathered to gape at those early wonders of illumination and the Ottawa Electric Light Company no longer exists as such. The assets of its successor were purchased by Ottawa Hydro in 1950. However, two small generating plants at Chaudiere Falls still produce about three per cent of Ottawa's electricity and serve as a reminder of the colorful past.

Like the subdued lighting, the bicycle trails, the skating on the Rideau Canal and the yen for just plain growing things, they help stimulate the new feeling of romanticism and nostalgia that pervades this historic city. But what's so wrong with that?



xation Data Centre . . . a big customer of tawa Hydro.

WHAT'S GONE WRONG WITH SCIENCE?

by Les Dobson

Leonardo da Vinci was not only a painter and sculptor, but also an inventor and a civil and military engineer. With many of his contemporary artists, he studied anatomy by the practice of dissection. He pondered over the flight of birds and even produced designs for a kind of primitive helicopter.

One of the most popularized figures of the Renaissance period, Leonardo symbolizes a technico-artistic culture that seems strange to the modern world. Admittedly, its benefits were enjoyed by a privileged few, but never since has there been such harmony between technology and the fine arts.

Engineering and art were fused to a remarkable degree in the cathedrals, for example, while the paintings of the Dutch masters blended industrial structures with the countryside as though they were part of the natural landscape.

Not so today. Indeed, the rift between the humanists on the one hand and science and technology on the other has become so great that science is under attack from all sides, including from within its own ranks. All this appears to have erupted as technology reached the pinnacle of achievement in landing man on the moon.

The arguments of the disenchanted take many forms. Why spend billions of dollars on the space program when so many social ills remain unresolved on earth? If we can put a man on the moon, why can't we find a cure for cancer? Technology is portrayed as an uncontrollable monster, marching along under its own momentum destroying individualism and wrecking the environment.

The anti-science movement has caught on like a forest fire. Stores sell pollution kits to children. Teachers order ecological kits for their classes. Numerous protest groups have either sprung into being or are experiencing a dramatic revival. Pollution Probe, the Sierra Club, the Ontario Federation of Naturalists see their names in print more often today than ever before. They're influential, they know the value of publicity and they're well organized.

The battle cry has been taken up by the youth counter-culture, which has turned to the arts and handicrafts, eastern religions, astrology. Science is abhorred. Yet the back-to-nature, ban-insecticides, life-in-the-commune youth culture rests squarely on the electric guitar, the internal combustion engine and hallucinatory chemical agents that are the products of twentieth-century technology.

militant groups go through courts

Electric power utilities are as much a victim of the anti-technology movement as any other industry. Perhaps even more so, because their size makes them an obvious target. Summer power shortages caused by the large air-conditioning load along the U.S. eastern seaboard and in Michigan are now a perennial affair. Consolidated Edison, the utility which supplies New York City, has been repeatedly frustrated in attempts to expand its capacity.

Plans for new power plants and other facilities have been blocked by militant environmental groups, which have progressed from mere protest to litigation to achieve their goals.

The situation has become so critical that Governor Nelson Rockefeller last year signed a bill creating a state



board to oversee the siting of power stations to ensure they'll be compatible with the environment. Hopefully, this will permit some plants to be built, somewhere. And the 183 investor-owned utilities that make up the Edison Electric Institute urged at a meeting in San Diego last June the establishment of a national energy council to provide a "reasonable balance" between the nation's environmental goals and its growing energy needs.

snow speaks of two cultures

While the dichotomy between arts and science is nothing new, Sir Charles Snow caused a stir in the academic world by referring to them as two distinct cultures in his Rede lecture in 1959.

Sir Charles, novelist and scientist, saw western society increasingly split into two polar groups – literary intellectuals and scientists. Between the two, he said, there is "a gulf of mutual incomprehension and sometimes (particularly among the young) hostility and dislike, but most of all lack of understanding.

"They have a curious distorted image of each other. Their attitudes are so different that, even on the level of emotion, they can't find much common ground."

gap less in the soviet union

Snow laid part of the blame on early specialization in the schools, particularly in his native Britain. He labelled today's society of electronics, nuclear energy and automation as being part of a scientific revolution as distinct from the industrial revolution. But if the traditional culture never understood the industrial revolution, how much less can it hope to understand the scientific revolution?

According to Snow, there was less specialization in the United States and the USSR than in Britain. There was less of a gap, he said, between the two cultures in the Soviet Union than elsewhere. While the pure scientist might not be understood there, the engineer is and he figures prominently in contemporary Soviet literature.

In spite of the popularization of science by television and the print media, the general knowledge of the non-scientist is deplorable. Ask a non-scientist for a brief description of the principles of relativity and see what he says. Yet Einstein's concept of a space-time continuum is half a century old and his theories laid the foundation for nuclear power and laser technology. Which opens the question as to whether our modern-day educated and literate society is any better equipped to grasp the relationship between space and time than, say, was medieval Europe able to comprehend the idea Copernicus espoused that the earth moved around the sun.

everyone is to blame

In Canada's Report of the Senate Special Committee on Science Policy, McMaster University's department of religion states: "Whatever the shortcomings of the scientist, the rest of us must bear part of the responsibility for the unfortunate influences of science in the modern world, for we have been content to be so ignorant of even the most elementary aspects of the scientific enterprise that we have not known how to assess, appreciate and complement the scientist's work."

With such basic scientific gaps in his education, how can the individual be expected to grasp the problems of extracting sulphur dioxide from flue gases or the difficulties in placing a high-voltage transmission line underground? This is not to excuse the utilities from seeking solutions. There's little doubt that an attempt to provide answers to what the human race is doing to the ecosystem is long overdue.

industry aware of social role

In concert with utilities the world over, Ontario Hydro is pursuing the goal of sulphur dioxide removal and the burying of high-voltage cables, and is trying to achieve an aesthetic meld of overhead lines with the natural environment. Many trees are being left standing on rights-of-way, which are also sown with cover crops to provide a natural habitat for small animals. In urban districts, experiments in the use of rights-of-way as recreational areas are taking place in the form of bicycle paths, hiking trails, golf courses and the like.

Increasingly is industry beginning to recognize its social role; admittedly sometimes in response to public pressure, but also in the growing realization that productivity and profitability are not the only goals.

difficulty in communicating

Bridging the gap between Snow's two cultures, though, will require much more. Not only must our education system take the sciences more into account in a generalized way, scientists themselves must also put their own house in order.

In most cases, communications between scientist and non-scientist are dismally poor. Even scientists in different branches of the same discipline

(*continued on page 14*)

intake fish may shun rock 'n' roll

A "dramatic change" has occurred in the waters off Ginna nuclear power station, says Dr. Jack Storr, associate professor of biology at State University of New York.

Two years ago the water stank with algae and divers were forbidden to enter the lake at this point. No fish lived there.

But since plant startup in 1970 the algae have been greatly reduced, fish thrive in the area and divers make regular underwater inspections.

One underwater photo showed 37 sunfish.

Dr. Storr, who was introduced by Dr. Ray Effer, Hydro's supervisor of Environmental Studies, described the improvement in water quality to a Generation Projects seminar, which was attended by representatives of Hydro, two provincial government ministries, the Great Lakes Institute and AECL.

Dr. Storr, a Canadian-born biologist, has supervised on-site hydrological and biological studies at the Nine Mile Point and Ginna nuclear stations on the south shore of Lake Ontario over the past five years. Both stations started up in 1970.

Dr. Storr uses fish nets, tagging and an echo-sounding device to track fish in a plant's thermal plume. The echo-sounder is suspended beneath a 17-foot boat and scans through 360 degrees.

Dr. Storr said that by using the echo-sounder they can locate fish, determine their size and make a "fairly accurate" count. About 1,000 fish have been tagged at both plants and many tagged fish are observed underwater by divers.

A chart linked to the echo-sounding device gives a printed record of the location of schools of fish and reveals their habits. Dr. Storr showed several of the charts on slides to the seminar.

Fish habitually dwell on the perimeter of the thermal plume, dive into the current, feed heavily and dart out again.

Species found include yellow perch, bluegill sunfish, smallmouth bass and crayfish. Gammarus, a bottom-living organism described by Dr. Storr as an important link in the food chain, also dwells there.

The plume appears to protect fish from wave action, he said. In rough weather schools of bass come into the plume and feed voraciously.

Dr. Storr said only two coho salmon and one lake trout have been netted in the past five years and he believes such cold water species will not move into power plant discharges. The only fish captured on the lake surface have been a few alewives.

Fishing has become such a popular pastime at the Ginna plant that guards have to be posted to protect sampling nets from damage. Researchers pay $2 for each fish caught and one angler showed up one day with eight, he said.

He criticized past research into the growth of cladaphora, an objectionable type of algae that consumes oxygen when decaying. Researchers had been "too busy looking at the tail end of a grasshopper to see how far it would jump" instead of looking at important factors such as light, temperature and nutrient supply which control growth.

Dr. Storr indicated that water temperature and discharge current flow were factors in reducing the amount of cladaphora growing in the area.

The maximum growth rate of cladaphora occurs at about 65 degrees. Below 50 degrees and above 80 degrees growth is minimal. When the amount of daylight increases to 14 hours from 12 hours, the growth rate almost doubles, he said.

Dr. Storr said much research will have to be done to determine the effect of a number of large power stations on the entire lake.

Discussing ways to divert fish away from power plant intakes, Dr. Storr said rock 'n' roll music may be best.

Bubble curtains and pulsed sounds don't seem to have much effect, he said. However, fish were sensitive to vibrations and turbulent water and he suggested these should be explored as control methods. □

what's gone wrong with science?

(*continued from page 12*)

sometimes have difficulty in communicating, let alone explaining their work to the public at large.

While a growing number of technical people realize the importance of being able to express themselves in plain everyday language, there is still a considerable school of engineers and scientists who clothe everything they say in gobbledygook. Such phraseology is habit-forming and spills over into non-technical communications such as letters and memoranda.

managers attend pr seminars

At Ontario Hydro, the problem of the technical person communicating effectively with the layman is well recognized and engineers, particularly those who come into contact with the public, are encouraged to be as frank and open as possible, explaining their problems in simple terms. Communications specialists are assigned to assist divisions which have frequent public exposure, such as the property division and transmission and distribution projects.

Seminars are held at regular intervals for such personnel as area office managers, who meet the public every day. The course deals with basic public relations theory, and teaches managers how to deal with inquiries from the news media and how to prepare a news release.

preservation of elite groups

Some of those scientists who do know how to communicate science in simple terms – the Ralph Lapps and Fred Hoyles – make good money at it. But often the mumbo-jumbo pronouncements that pass for communication appear more aimed at preserving the image of a knowledgeable elite than gaining the understanding and acceptance of the man-in-the-street.

Dr. David Suzuki, the flamboyant, free-wheeling geneticist from the University of British Columbia, who has done so much to popularize science on TV, feels much of the sickness in society stems from elite groups of specialists – he extends the term to cover everyone from scientists to lawyers and plumbers – who either assume or are granted complete control of certain social functions. They then become preoccupied with the protection and extension of the group at the expense of society as a whole.

Admitting that the application of all scientific knowledge is double-edged, and can be used for good or ill, Dr. Suzuki says these groups of elite seldom ask themselves about the long-term consequences of their actions.

Of his own discipline, which holds perhaps the most frightening consequences for mankind, he says: "So long as geneticists cloak their knowledge in scientific jargon and fail to communicate the implications of their work to the public, the ultimate use of this information will not be predicated on the best interests of society."

science taking proper course?

Finally, there is the question of whether science itself is being channelled in the right directions, and whether too much attention has been focussed on the physical rather than the social sciences.

Comments the Senate Science Committee report: "Every year we are building more schools, more universities; we are providing easier access to education. And yet we have more student unrest and more parental concern that our children are not getting an adequate preparation for real life.

"We are spending large sums to improve housing conditions, but our cities are becoming more and more crowded and inhuman. We are spending over three billion dollars every year on social security, but the poor are becoming relatively poorer and more and more restless as they live, through television or otherwise, close to affluence. We are building more hospitals and providing for free hospitalization and better medical care, but a greater number of people die of incurable diseases, and the mysterious diseases of the mind are spreading.

"Our obvious failure to cope with our collective problems forces us to recognize that we do not even understand the true nature and the real dimensions of most of these difficulties. In other words, we are just beginning to realize that we have seriously neglected to support research and development activities in these crucial sectors." □

THE QUALITY OF LIFE

by J.J. Durand

Mr. Durand, who is Ontario Hydro's director of public relations, gave the following speech to some of the OMEA's district meetings.

In the past few years people have made it clear that as we go about the business of providing electricity in Ontario they expect the net effect will be an enhancement of their lifestyle.

This, of course, means that we have to respond responsibly to the needs and expectations of the public – it means, too, that we must conserve and maintain the natural resources of the province. Contrary to common belief, they aren't inexhaustible.

This is the real challenge to the utility business today – we use vast quantities of land, air and water as well as vast quantities of irreplaceable natural fuel resources. These are precious public resources. No wonder there is concern and no wonder we're being questioned. No wonder the public wants to know what we intend doing with these precious resources before we do it.

The electric utility industry has a heritage of accomplishment that, I think most people would agree, has resulted in public confidence in technical areas.

But people are saying, "Okay, you've done reasonably well in the past and we give you credit for this – but we still want some indication that you are aware that the public's standards have changed and that you are aware of your changing role in the community – that you will provide our electric energy needs but at the same time will safeguard our precious natural resources." In other words, we have an accountability that didn't exist, to the same degree, in the past.

There are those who say that our lifestyle is changing too rapidly – and who talk about technological advancement as though it were a social scourge. They claim that the electric utility industry has been needlessly encouraging advancement as well as the growth that forces this advancement.

The thing that bothers me is that we often retreat into a defensive stance, saying we only respond to this growth, we don't create it when we should be saying that certainly our industry has been encouraging technical advancement and progress.

Think for a moment what our quality of life would be if the electrical utility industry had not developed to meet the needs of the communications industry, the needs of the data processing and computer industry or to meet the needs of the transportation industry or the food processing industry.

Think for a moment of the 180,000 new jobs that would not have been available in 1971 to fill the needs of Ontario's growing work force if our industry hadn't developed to meet the needs of industry in general. We are an expanding industry with severe social responsibilities and we should be proud of this role and what we are doing to fulfill these responsibilities. The lifestyle in our communities has come a long way and a good chunk of this progress was due to the advancement of our electrical utilities.

There are those who say that the electric energy industry should be restraining economic growth and, as a consequence, population growth.

It seems to me that to do this, assuming we could, would be to ignore our responsibilities to the community in general and to our children and their children in particular. Certainly, we can't turn our back on the future.

It seems to me, too, that one of the reasons utility people have been so proud of our role in society is the fact



ective cutting of trees along
or rights-of-way allows high-
age transmission lines to blend
the landscape.



that our industry has been one of the foundations on which the social and economic progress of this province has been built – it has responsibly solved many of the problems of the past. I wonder why people now feel that we can't solve the problems of the future?

I wonder, too, why some people let themselves fall into the trap of thinking that the role of the electrical utility in the past was more significant and more rewarding than it will be in the future – when, in fact, the needs of the future are at least as great and when, in fact, the significance, and the rewards, of our future role appear to be even greater.

I can't feel any loss of personal satisfaction as a result of the change in public expectation. I can't help but look to the future of the electric energy industry with a great deal of enthusiasm.

Mind you, this enthusiasm is qualified to the extent that there are certain things that have to happen. For example, we have to clean up our generating plants. Ontario Hydro and other producers have to come up with a commercially operative process which will remove or substantially reduce the sulphur and nitrous oxides from the stacks at our generating plants – scientists predict that this will happen within this decade.

Another thing is that we will have to involve the public early as we develop our plans for the future, particularly as we develop station siting and transmission line location plans. As you are well aware, we are having some dramatic lessons in this area. But it's encouraging to note that positive steps have been taken toward planning with public participation. In fact, this process is currently being used to establish the route of the 500-kv transmission lines from Lennox generating station, near Kingston, to Wesleyville, near Port Hope. This includes elaborate ecological studies as well as a plan to minimize the environmental impact of these lines.

We feel very deeply the realization that the success or failure of Ontario Hydro's role in this province will depend on the quality of its reputation, not just as a technically-oriented organization able to provide electric power when required, but as a people-conscious organization able to respond to the changing needs of the users of electricity and of the community in which they live.

In other words, we know that Hydro's success or failure depends on how conscientiously the total organization works at establishing good relations with the public – and I am sure this applies equally as well at the retail level.

One of the points I've tried to make so far is that no one should feel any loss of pride or personal satisfaction in this industry, nor should there be a feeling of pessimism. Critics of the electrical utility industry talk about our environmental impact. Well, let's look at this question of pollution. What about this environmental challenge?

There is no doubt but that the producer, Ontario Hydro, has contributed to the pollution problem at our coal-fired generating plants. But we are just as concerned as any other citizen about the degradation of our environment and we're doing something about it. In fact, this concern goes back through many years. Society's standards understandably have become more demanding, but in many cases our actions have preceded society's requirements. In other cases we are responding as quickly as possible. While the solutions aren't necessarily of the instant variety, there is progress being made.

The important thing is that we do recognize these responsibilities and we do show our concern by reducing the incidence of pollution at our existing plants and at the same time make sure that our new stations are designed to either eliminate, or at least minimize, their effects on the environment to the point where they have as little impact as possible.

Let's take the Hearn plant, for example, the much publicized big offender. During the past few years several corrective measures have been taken including the selective use of low-

sulphur-content coal, conversion of some units to gas, improved precipitators and the replacement of the low-level stacks with a 700-foot stack. The cost of this conversion and the new stack was around $13 million with additional operating costs of $5 million annually.

As you know, the sulphur oxides and nitrous oxides emitted from the stacks are considered to be the gases that are of primary concern. The work that we've done at the Hearn plant has resulted in the reduction of the SO_2 emission by more than 70 per cent between 1969 and today, and although the nitrous oxides emission remains about the same, the ground level concentration is 500 times less than the limits set by the Air Management Branch.

We are convinced, too, that the nuclear power program is a key to a cleaner environment.

I mention these things because these attitudes, these responses and these happenings are really preparing the way for the future role offered the electrical utilities as a result of society's need to clean up and preserve the environment.

Government studies show that if we continue to use coal, gas and oil to produce all forms of energy required as we are doing today, we will triple the production of pollution by the year 2000 – an intolerable situation.

These studies also show that if we assume the implementation of all known and anticipated pollution control improvements in the electric power industry, and in the automotive as well as in other industries, our production of pollutants by the year 2000 will still be 30 per cent worse than it is today. Still an intolerable situation.

However, with the development of a stack gas desulphurization process and other emission control techniques, electric power will become the least polluting of all forms of energy produced from the fossil fuels – gas, oil and coal. And this position is further strengthened by use of the nuclear process.

It follows it will be desirable from an environmental standpoint to substitute electric energy for the more polluting forms of energy use. Even our strongest opponents agree that this is so. In the past couple of years, application has been made for 257 patents covering devices that will help clean up the environment. They all have one thing in common – they need electricity to power them.

Let's consider some predictions. By using more electric energy in the transportation field – electric cars and trains – in the process heat and space heating industries, and electric furnaces in the steel industry, it has been predicted that by the turn of the century:

1. The total level of pollution emission could be reduced by about 35 per cent annually.
2. There could be a 30 per cent saving on the use of our diminishing fossil fuel resources.
3. There could be about 10 per cent reduction in the heat discharged to the environment.

This would mean that by the year 2000, between 50 and 60 per cent of all the nation's energy needs would be provided by electricity.

Whether or not we accept the absoluteness of these figures is not important. The important thing is that the potential of the electric energy business as an environmental cleaning agent is clear and that the electrical utilities must be prepared to meet this challenge and to accept the major responsibility for the care and maintenance of the environment. We must use our resources wisely. We must not let our programs and our other less important objectives jeopardize our ability to produce and supply this electric energy needed in the future.

It means that Ontario Hydro must consider as one of its top priority objectives the development of a commercially operative process to remove sulphur dioxide at its fossil-fired generating plants – and it does.

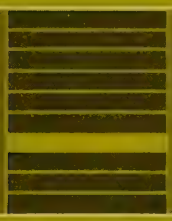
It also means that we have to acquaint both our staff and the public with the utility's ultimate role in the struggle to protect our environment.

It seems to me that the electrical utility industry is in a period of transition. A period of delicate balance, one that can be used as a springboard into an era of even greater public service with its attendant satisfactions – or one that can lead to an era of diminishing public service with all of its disappointments.

Which route we travel depends on a number of things – but all of these things can be translated into terms of understanding the electrical utility's role. First, we have got to understand it, then our staffs have to understand it, and we have to ensure that our role is understood by the various levels of government as well as by the public. □

measuring up for the 80's

by Sheila Kenyon



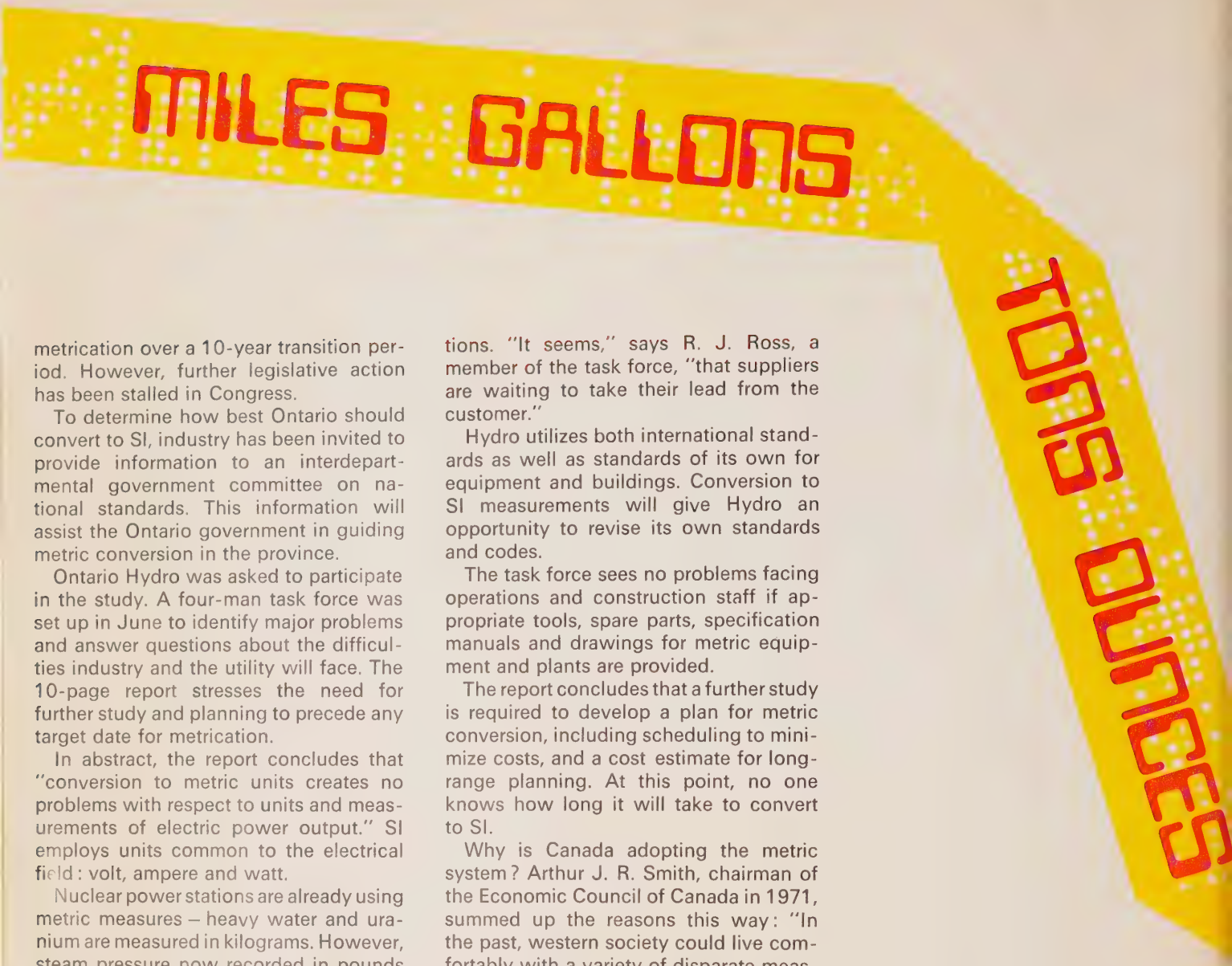
Think you're a swinger? Your great grandchildren will remember you as a "square" with your miles per hour, pounds of butter and wacky body measurements in pounds, feet and inches. Future generations will think our ways of measuring as antediluvian as we think of cubits or pieces of eight. For Canada is undoubtedly going metric. Already the weighing of new babies in many Ontario hospitals in pounds and ounces is history. A seven pound, one ounce infant today weighs three kilograms.

The baby chart isn't the only thing that is changing in hospitals. Today, normal body temperature is 37 degrees Celsius, formerly Centigrade.

Thus change to metric has begun, although only on a limited and piecemeal basis. Eventually most things will be measured in metric or, to be more specific, we will have to think in terms of the International System of Units (Système International d'Unités). That's SI.

The next decade will see all the large trading nations using the metric system as their standard of measurement for everything from hats to peanuts, fabric to wearing apparel, bed sheets to buildings.

Taking the lead from countries already adopting SI, Canada issued a White Paper on Metric Conversion in 1970 outlining the eventual adoption of a "single coherent measurement system based on metric units." The United States, the largest industrial nation in the world that hasn't yet switched to SI, is on the brink of commitment. In a surprise move early in August, the Senate Commerce Committee approved legislation calling for



metrication over a 10-year transition period. However, further legislative action has been stalled in Congress.

To determine how best Ontario should convert to SI, industry has been invited to provide information to an interdepartmental government committee on national standards. This information will assist the Ontario government in guiding metric conversion in the province.

Ontario Hydro was asked to participate in the study. A four-man task force was set up in June to identify major problems and answer questions about the difficulties industry and the utility will face. The 10-page report stresses the need for further study and planning to precede any target date for metrication.

In abstract, the report concludes that "conversion to metric units creates no problems with respect to units and measurements of electric power output." SI employs units common to the electrical field: volt, ampere and watt.

Nuclear power stations are already using metric measures – heavy water and uranium are measured in kilograms. However, steam pressure now recorded in pounds per square inch would be measured in pascals in SI. Energy measurements now in British thermal units would be replaced by kilojoules, and other Imperial measures would change to SI standards. For instance, the Celsius thermometer will replace Fahrenheit.

Successful metrication is dependent on our ability to think metric. The task force estimates that up to one year will be required to assemble and distribute information such as booklets, posters and films. There will be classroom sessions as well as on-the-job training. The onus will be on management to play an important role in education and in a "Think Metric" campaign.

Other areas considered by the task force were: construction, Hydro standards for equipment and buildings, availability of metric equipment, and metric spare parts and tools.

If it follows the British pattern, Hydro will have to decide on a target date to begin metric construction as well as equipping buildings and generating stations. "It seems," says R. J. Ross, a member of the task force, "that suppliers are waiting to take their lead from the customer."

Hydro utilizes both international standards as well as standards of its own for equipment and buildings. Conversion to SI measurements will give Hydro an opportunity to revise its own standards and codes.

The task force sees no problems facing operations and construction staff if appropriate tools, spare parts, specification manuals and drawings for metric equipment and plants are provided.

The report concludes that a further study is required to develop a plan for metric conversion, including scheduling to minimize costs, and a cost estimate for long-range planning. At this point, no one knows how long it will take to convert to SI.

Why is Canada adopting the metric system? Arthur J. R. Smith, chairman of the Economic Council of Canada in 1971, summed up the reasons this way: "In the past, western society could live comfortably with a variety of disparate measures and systems of measure. But as our society has become more technologically oriented, particularly over the last two centuries, and as international trade has grown to large dimensions, the importance of having compatible and accurate measures has increased considerably."

One of the reasons for choosing SI as an international measuring standard is its simplicity. All units, their multiples and submultiples are related to each other by the simple factor of 10. It is easy to convert from one metric measure to another, especially for the North American who already bases his monetary system on 10. This is one of the reasons why Britain abandoned the old value of pounds, shillings and pence and changed to the decimal system of coinage in line with the changeover to a general metric system.

The English-speaking world was given its first documented standard of measurement in 1215 with the Magna Carta. Incorporated into that historic document were established standards for the consumer so that he could expect fair meas-


VALIDITY CHECK
FEED STOP
FEET
KILO METRES LITRES

from bushels and pecks to the candela and mole

urements for goods acquired by barter or coin.

When the Magna Carta was drawn up, little thought was given to where these accurate measurements might lead – to space travel and the utilization of nuclear power. The Magna Carta established standards for King John's people so they would less likely be cheated: "There will be one measure of wine throughout the kingdom, and one of ale, and one measure of corn, to wit, the London quarter, and one breadth of cloth. . . ."

As civilization grew, other standards came into existence. Britain established a yard, supposedly at first the distance between the nose and the tip of the fingers of one arm extended. This might have been fairly accurate for a yard of cloth traded for a cabbage, but better measurements became imperative.

Many British monarchs became involved in establishing standards – Elizabeth I created a new standard yard bar to replace one produced in the time of Henry VII. The Elizabethan bar, a brass rod, one-half inch square, remained Britain's standard yard measurement until early in the 1800's.

During the growth of the British empire and the strong ties of common language and trade in the new world, most English-speaking nations adopted the common Imperial measures: yards, rods, furlongs, links, chains, pecks, bushels, pennyweights and so on – a large collection of weights and measures that have confused generations of school children.

Many of these are now obsolete and the remainder will soon change. It has already been recommended that the metric system be introduced in the schools across Canada in 1973-74. This is under study by a task force set up by the Ontario Ministry of Education. Metric is being introduced in teachers' colleges this year.

The metric system originated in France shortly after the revolution. It was officially adopted there in 1793. In 1860, both Britain and the United States acknowledged its efficiency by authorizing it as a second system. In 1964, just prior to starting conversion to the metric system, Britain redefined the standard yard bar as 0.9144 metre.

The International System of Units is the most modern, up-to-date measuring system and is built on seven basic units: length – metre; time – second; mass – kilogram; temperature – kelvin (from which the celsius scale is derived); electric current – ampere; luminous intensity – candela, and quantity of substance – mole.

The technical and research services to the SI system are located in Paris on land defined as international territory. The bureau is under the general direction of an international committee, of which Canada is an active participant.

Britain's decision to convert to the metric system gave other English-speaking nations the impetus to convert. The British decision was based on hard facts: her entry into the European Common Market and the loss of trade if she didn't adopt their standard measurements. Britain's metrication was announced in 1965 and a 10-year plan was drawn up for a moderately paced conversion. Today, she is well along the road with other nations adopting the system including Australia, New Zealand, South Africa and Pakistan. Countries where the metric system is already established include Japan, China, Germany, Italy, the Netherlands and the Soviet Union.

What are the implications facing Canadian industry and the man-in-the-street?

Most people agree that metrication i inevitable. "With our advancing techno ogy it will make scientific records muc more simple to interpret using commo international standards," said John Bren ciaglia, member of the Hydro task forc

Hydro has already gone metric at th new Bruce nuclear station on Lake Huro – all the instrumentation will be metri Nuclear personnel at the Pickering plan east of Toronto have all been trained in th SI system. Staff from Pickering and th Douglas Point and NPD plants will pro vide a trained nucleus of metric-traine people when Bruce starts operation i 1976.

Because eventual adoption of the me ric system is a federal government dec sion, industry has no alternative but to g along. Some industries are enthusiasti particularly those with overseas marke that have been missing business by n being metric. The Steel Company Canada, as long ago as 1967, was makin a line of metric nuts and bolts. Newsprin one of Canada's leading exports, has bee supplied to overseas customers in metr measurements for years. The pharmaceut cal industry changed to metric measu several years ago.

The most significant announcement affect industry is IBM's recent decisio to begin a gradual transition to metr design and manufacturing. This plac IBM among the first segment of U. industry to catch up with the rest of th world and will have a direct effect on th computer industry in Canada.

The consumer will be made acute aware of metrication as the new Co sumer Packaging and Labelling Act tak effect. Canadian manufacturers will b required to label products either in metr only, or in metric and existing standard

a manufacturer wants to indicate only
ne measure on his label, it must be
etric.

Wabasso Limited, one of Canada's pri-
ary textile manufacturers, is already
ackaging bed sheets in inches and cen-
metres. But the big change will come to
e public-at-large when we convert to
etric recipes, kilometre speed limits and
asoline measured by the litre. The ideal
minine figure will no longer be a svelte
6–24–36 inches but a shapely 91–61–91
entimetres.

What about the cost factor? That's one
the headaches of the Americans. A
port prepared for the United States
ongress, "A Metric America – A deci-
on whose time has come," examined the
os and cons and tried to estimate costs.
ne U.S. senate committee studying met-
cation has decided "to follow the British
olicy of letting the costs of metric con-
ersion lie where they fall," according to
e Wall Street Journal.

It is estimated that it will cost the
merican manufacturing industry alone
me $32.6 billion. At the same time, one
uthority is convinced the U.S. aerospace
dustry will save $65 million annually in
ngineers' time through complete con-
ersion.

Canada cannot completely convert until
e United States does so. Both countries
ill probably set up an integrated program
nd ask industries to supply conversion
hedules. If the U.S. reaches a decision
on, it will smooth the way for Canada
go metric in step.

Ontario Hydro's Standards Committee
ports that "conversion in some areas
ill be relatively simple and inexpensive
ut in others it certainly will not." Britain
as been extremely uptight about reveal-
g costs. She has stated that retraining
ograms have not been as formidable as
nticipated – reflecting some savings.

The Globe and Mail puts Canada's
and total at between $2 and $4 billion.
might make a good subject for a lottery.
ational metrication cost will be any-
ody's guess.

Jack Bell, chairman of the Ontario
inistry of Education's task force, feels
public education program should be
started extremely early in the metrication process. However, progress will be slow. Britain still hasn't reached a decision on her speed limit signs . . . whether to convert to kilometres per hour or to put up a dual sign.

Replacing speed limit signs alone will be costly. In Ontario, for example, annual sign maintenance costs run as high as $1.3 million.

Undoubtedly, the longer conversion is delayed the higher the eventual price tag. U.S. supporters may be wishing the country had followed George Washington's advice when he opted for metric in his first speech to congress. And if Lloyd George hadn't been so eloquent fighting against the very thought of a Britisher ordering "half a litre of beer," Britain's attempt to convert to the metric system in 1907 might not have been defeated.

In Canada, the scales in favor of conversion have started to swing. According to Stevenson Gossage, chairman of the Commission of Metric Conversion, Canada will be metric by 1981 "proceeding toward metrication in close step with the United States." □

revamping those old favorites

Multiplication is vexation,
Division is as bad.
The rule of three,
Doth puzzle me,
And practice drives me mad.

Undoubtedly, metrication will remove many of the old confusions, but it will introduce some new ones, too. Certainly, the song writers will have a field day rewriting the traditional favorites.

One wonders whether "Mammy" would have been quite the success it was had Al Jolson sang "I'll walk a thousand kilometres for one of your smiles." And "I love you, a bushel and a peck" might well be enhanced to "I love you, thirty-six litres." Neither will nursery rhymes or sacrosanct "The crooked man" will be walking 1.6 kilometres.

According to Robert F. Legget, author of "Standards in Canada," any table prepared for metric conversion must acknowledge the unique measures used by the fishermen of Newfoundland. A coal tub is the term they use to describe 100 pounds, and there are cabers, a herring tub indicates a volume of 16 gallons, a herring barrel is 32 gallons. There's also a hogshead, a salt cart and a sand barrel.

It's difficult to envisage a fisherman at the helm of his vessel, swept by howling gales, trying to manipulate a conversion table to translate herring tubs to litres in trying to determine how many kilograms in a coal tub.

Metric will bring other difficulties too. Recently, British department stores were selling metric-size sheets before the mattress manufacturers had wrapped to metric-size mattresses.

And have you ever wondered why overseas air passengers have such a strange baggage allowance of 44 pounds or 66 pounds first class? These weights are conversions from the international baggage allowances in kilograms – 20 kilograms equals 44 pounds and 30 kilograms is the equivalent of 66 pounds.

Anyone wishing to keep to the old standard measurements will either have to go up in the air or voyage on a round-the-world cruise. The knot will remain unaffected luminously within the metric system, and is equivalent to 1.1508 statute miles or 1.853 kilometres per hour.

the Bishop of Meaford

by Rae Hopkins

He wears a triple crown for achievement in community relations

A five-by-seven-inch walnut shield bearing a wreath of laurel, symbolic of Olympic achievement, is affixed to the south wall in Meaford Public Utilities Commission manager Roy Bishop's office. The eight short lines engraved into the gold plaque pay tribute to the town's 1969 citizen of the year for "excellent community service."

And in the main office three rectangular walnut plaques with town crier's bells attached tell the utility's customers that the PUC has won the Ontario Municipal Electric Association – Association of Municipal Electrical Utilities community relations award three years in a row.

Roy Bishop, 44, was the first recipient of Meaford's highest award. His utility is the only three-time winner of the OMEA-AMEU public relations prize.

It was on the first day of summer, 1966, that Roy Bishop, a slightly built former professional dancer, first set foot in the Meaford PUC manager's office. It was on that same day he decided Meaford PUC must portray itself as it really was – a friendly group of people dedicated to serving the community. And it was on that day that Meaford PUC's on-going, prize-winning community relations program was born, a full three years before the two associations representing the public utilities of the province announced their public relations contest for member municipalities.

In the same week the Meaford Express carried a news item announcing Roy Bishop's appointment as PUC manager. That article has been clipped and preserved in a photo album – first of more than a score of them containing every word that has been written, or broadcast, about the utility since that time.

Sincerity coupled with community involvement are perhaps the keys to Roy





Sparky, a popular emissary of Meaford PUC, has a rapt audience as he delivers a lecture on electrical safety. In the commission's boardroom, he joins manager Roy Bishop, left, and Meaford mayor Don Ferguson with the junior commission.

ishop's public relations success. Few vic projects undertaken in Meaford do ot have Mr. Bishop on the steering ommittee. And he can claim credit for itiating many innovative civic projects ndertaken by this pleasant little town about 4,000 situated in the apple rchard country near the southern end Georgian Bay.

Take, for example, Meaford's Golden own promotion.

It was after a visit to Barrie when he w that city's "Beautiful Barrie" slogan osted just about everywhere that he lt Meaford also needed something to raw the townsfolk together. He came p with the "Golden Town of Meaford" ea and sold it to the Chamber of Comerce. It was later changed to the Golden Town of Opportunity," but the mpler Golden Town is the title that uck.

Why Golden Town? "Simple," says Ir. Bishop, "gold is precious. And one ears a gold band when one gets married. hat band symbolizes two people united. chose 'Golden Town' to show that the eople of Meaford are a united people, edicated to make our town a better lace in which to live."

First visual evidence of the new-look olden Town was the coat of gold paint pplied to the Main Street light standrds – a co-operative venture between ne Chamber of Commerce, the town ouncil and the utility. The first two roups supplied the paint and the utili-'s staff organized the venture.

Then illuminated golden horseshoes ere applied to the lamp standards to ggest that anyone fortunate enough to ve in Meaford was lucky indeed. And ne downtown decor shifts with the easons. Hallowe'en lanterns tell the own's many visitors that the frost is on ne pumpkin and the bountiful harvest the surrounding countryside has once gain been reaped and stored. Christmas ecorations are particularly colorful and luminated sailboats on the lamp posts ll one and all that the summer folks are ack. Boats and boat-building are a way life here where the Big Head River mpties into the Bay.

Flower boxes on the bridge over the river were another Roy Bishop touch and the final product was a community effort. The boxes themselves were obtained from local industry by the Chamber of Commerce and the businessmen, and they were installed by the utility staff. The IODE holds a tag day to raise money for the flowers. Then there are the home shows, the apple festival and the parades, all of which are staffed with the assistance of the people of Meaford PUC on their own time.

Identifying their parade floats and booths at the various civic "do's" is the now familiar banner telling the people that Meaford PUC is "The Friendly Hydro With the Power to Serve." It's a catchy motto and it really is contagious, inside the utility and outside.

Those three plaques in the business office mean as much to the people who work there as they do to their manager. But, say office girls Beverly Mielhausen and Susan Neale, they mean even more to the customers. Office manager Vern Ashby echoes this sentiment.

It's catching in the line department, too. Foreman Harry Jones with linemen Ray Powell and Ed Ornsby are as at home in the utility's Sparky costume lecturing on electrical safety to the public school kids as they are in an aerial bucket changing insulators.

The Sparky outfit was made by Roy's attractive brunette wife Jean, who has also been caught up in the enthusiasm of her husband's public relations programs.

Time is the precious commodity which everyone connected with Meaford PUC is expected to contribute to the community relations effort. Money they seem able to do without. Roy Bishop has been operating the province's most successful municipal utility public relations program for six years on a budget which, as he puts it, would buy us all about one free lunch.

Even the elected commission takes part. For example the "professionals" step down for a meeting once a year while the younger set, the grade six students, take over. At one meeting the kids even passed a motion calling for the installation of a golden bench on Main Street adjacent to the town hall. The red lettering on it tells you it was put there by the Golden Town PUC.

And to prove they actually did hold an "official" commission meeting, the young commissioners have framed certificates, designed by Mr. Bishop, to remove any doubts their friends might have. The junior mayor wears a chain of office – it was made by Mrs. Bishop.

But it's early June now, let's say, and there's a rate increase scheduled for the beginning of August. Roy Bishop has already prepared a news release for the local media containing all the details and he has now to deliver it to the newspaper office.

Perhaps Roy's most important ally is Meaford Express publisher-editor Mrs. Phyllis Brebner. She's expecting him to stop by this Monday morning for she's already been told that Mr. Bishop has some news for her.

"Roy Bishop," she says, "is extremely conscious of good public relations and he's always been ready to work with the media. And he's sincere.

"From time to time we do have power failures and when we do Roy Bishop doesn't attempt to make excuses. He tells us what's happened and he tries to tell us when we can expect to have our service restored. He never makes us feel it's an effort for him to answer our questions.

"Roy appreciates that we have deadlines to meet and he always makes sure we have plenty of time to research any story he gives us. Like the day I went to the office to get the story on the utility taking over the sewage billing for the town. He even went so far as to have his girls make up a mock bill for me so I could show our readers how they would pay for sewage services.

"He gets a lot of lineage in the press around here, but it's well-earned for he makes news. By that I mean 'hard' news, not the stuff that smacks so much of advertising that you're torn between sending the sender an invoice or filing it in the waste basket.

"I guess one of the keys to Roy's



Roy Bishop discusses Meaford's weekly newspaper, The Express, with editor Phyllis Brebner. PUC gets good coverage in all the local media.

excellent rapport with the news media is that he has great pride in Meaford PUC – it's a very personal thing with him, not just a job – and he wants the people of this town to know what the PUC is doing, and why.

"Roy Bishop is approachable, and he's truthful. He's the type of person the newspaperman delights in dealing with," Mrs. Brebner says.

Mr. Bishop also drops in on the Owen Sound Sun-Times' Meaford reporter at least once a week. He's in regular contact, too, with CFOS radio in Owen Sound.

But the good relationship goes much further than the news media. It extends to town council, all the various civic groups and to other utilities as well. For example, the town donated 10 acres of land to the PUC for a substation and development of a park to be known as 'Kilowatt Park." As Mayor Don Ferguson puts it, "it was our way of saying thanks Roy Bishop and Meaford PUC for all you have done to boost our town."

And the rapport extends to the utility's industrial customers, too. That same Monday afternoon Roy personally went to visit Jim Knight, president of Stanley Knight Limited, the flooring people and one of the utility's biggest customers, to tell him there would be an "adjustment" in the company's rates for electrical service. He didn't have all the details with him but would let him know what to expect as soon as he could. Next morning there was a follow-up phone call to Mr. Knight and this time the news was good. The flooring company would benefit from the new rate structure in the form of a reduction in the cost of power.

Among the in-coming phone calls Roy received that morning was one from Joe Bartoni, MacLean-Hunter Cable TV's Owen Sound manager. He just wanted to say how impressed he was with the questions the junior council and "commission" had asked during a previous-day visit to Ontario Hydro's Bruce Nuclear Power Development. Meaford PUC arranged the trip and set up the cable coverage.

Mr. Bartoni also informed Roy Bishop that there would be a slight delay in removing some wires from a pole the two utilities were sharing.

It's this sort of co-operation that makes Roy Bishop almost a household word in the town where even the parking meter heads are gold.

In fact, it was Roy Bishop and Mayor Ferguson that influenced MacLean-Hunter Cable TV to come to town in the first place. Roy's been a familiar face on the screen ever since discussing everything from the interlocking OH Hydro symbol to giving a running commentary on last year's Santa Claus parade.

Service to the community was the goal Roy Bishop set for himself and for his utility when he came to Meaford six years ago. It was his dedication in working towards this goal that prompted Mayor Ferguson to say "one of the best things that has ever happened to Meaford was the day when Roy Bishop came to town."

Similar sentiments undoubtedly influenced the decision of the judges in the last OMEA-AMEU Community Relations Contest. They used these words in describing his achievement: "Good slogan – backed by deeds . . . some very community-oriented and imaginative projects have insured that the utility is well thought of by its key public groups. . . ."

Roy Bishop wears his triple crown with modesty. □

birth of three new regions

Three new regional municipalities – Waterloo, Sudbury and Timmins – came into existence on January 1.

Formation of the new regional governments brings the number of reorganized municipalities in the province to nine. They include Ottawa-Carleton, Niagara, York, Muskoka, Thunder Bay and Metro Toronto.

The new regional municipality of Waterloo comprises seven municipalities with a population of 245,000. They are the new city of Cambridge made up of Galt, Preston and Hespeler; Kitchener and the village of Bridgeport, Waterloo, and the townships of Wilmot, Wellesley, Woolwich and North Dumfries.

Sudbury and six municipalities with a population of 152,000 form another new region. Other municipalities are Capreol, Dowling, Neelon and Garson, Rayside-Balfour, Valley East and Waters.

The new city of Timmins, as the new regional municipality is called, includes the Town of Timmins, the townships of Mountjoy, Tisdale, and Whitney and 24 townships in the surrounding unorganized territory. The population is 42,000.

Meanwhile, the pace of regional government has been stepped up in the Toronto area.

The Ontario government unveiled a plan on December 18 to create a new regional government extending about 65 miles along Lake Ontario from the eastern boundary of Scarborough to the vicinity of Colborne, east of Cobourg. The northern boundary zigzags from west of Uxbridge to the northern end of Rice Lake.

The area covered by the planned region includes 22 municipalities and parts of four others, including Ajax, Pickering, Whitby, Oshawa, Bowmanville, Port Hope and Cobourg. The new region would have nine municipalities.

The regional government could be in operation by January 1, 1974 but provincial government officials said there was no firm target date.

As well, the government made proposals in January for three regional governments west of Metro Toronto. These included the Peel, Halton and Hamilton-Wentworth areas.

along hydro lines



Critics challenged

OMEA Districts 7 and 8 held back-to-back meetings last fall at which they elected their executives for the coming year. Among those on hand were Ontario Hydro Chairman George Gathercole and Dr. Robert Hay, of Kingston, past president of the OMEA and a member of the Advisory Committee on Energy.

Mr. Gathercole focussed his remarks on the 17-week strike by Ontario Hydro's 12,000-member union. He took issue with those who criticized what appeared to be overstaffing as a result of the strike.

"Just because we were able to operate with only the supervisory staff doesn't mean we would have or could have continued. We were able to do it because Ontario Hydro itself is very capital intensive and automated. But there were many things that didn't get done which will have to be done now," the chairman said.

He noted that the Pickering generating station had to be closed and the commissioning of the Bruce heavy water plant was postponed because of the strike.

Worked with Sir Adam

A man who became known across Ontario as "Hydro Charlie" because of his work with Sir Adam Beck has died. C. J. Halliday, of Chesley, was 97.

Mr. Halliday was the man credited with bringing electricity to Chesley and served on the community's Public Utilities Commission from 1920 to 1958.

The nickname "Hydro Charlie" was given to him because of the vigorous campaigning he did with Sir Adam in the early years of encouraging towns to join the Ontario Hydro system.

He was a town councillor for eight years and served a term as mayor during the First World War. He was also active on the executive of the Georgian Bay and Ontario Municipal Electric Associations.

Rates go up

All Ontario Hydro customers started paying more for their electricity January 1.

Interim wholesale rates to municipal commissions have been raised by an average of 8 per cent, while the average increase to direct industrial customers is 12 per cent. To retail customers – cottages, farms and rural homes – the average increase is 10 per cent.

Involved in the increases are about 350 municipal utilities, 91 large industrial customers and 600,000 rural consumers.

Hydro Chairman George Gathercole says the increases are necessary because of inflation and the resulting escalation in the cost of equipment and supplies, interest rates, wages and salaries, fuels and anti-pollution measures.

Mr. Gathercole said the increases will not be sufficient to cover costs and that withdrawals will have to be made from the rate stabilization reserve. This fund was established to absorb the cost of such factors as variation in stream flows, major damage to equipment, delays in bringing generating plants into service, and fluctuating exchange rates. The fund was used last year when Hydro decided to defer rate increases until mid-year because of the state of the economy.

Convention date

Toronto's Royal York Hotel will once again be the scene of much activity when the annual OMEA-AMEU convention is held there March 5, 6, and 7.

The 1,500 utility people from around the province who will converge on the hotel will see some dramatic changes since last year's conference. The Royal York has undergone a multi-million-dollar facelift.

Although final program arrangements are not yet completed, the program committee is counting on the recommendations of Task Force Hydro to provide stimulating discussions at the 64th annual meeting.

Science Council studies energy

The Science Council of Canada is conducting a detailed study of Canada's energy requirements and options to the middle of the next century. Written submission from individuals and organizations are being sought.

According to Dr. Gordon N. Paterson, director of the study, the purpose is to co-ordinate the views of various organizations with an interest in the



A busy year lies ahead for the new executive of OMEA District 7. Seated are M. A. Greene, second vice-president, Exeter; Robert Austin, president, Arkona, and G. H. Hess, first vice-president, Zurich. Standing: R. S. Sheppard, Aylmer; R. J. Risdon, Thorndale; J. L. Thomas and A. L. Furanna, London; R. L. Hawkins, Tillsonburg, F. T. Julian, Woodstock, and Ross Fewster, Ingersoll.



Meeting in Petrolia, District 8 OMEA elected its executive for 1972-73. From left are Henry Ross, Sarnia; Carl Phair, second vice-president, Blenheim; M. J. Huddlestone, past president, Petrolia; Al Cousins, president, Wallaceburg, and Fred DeSantis, first vice-president, Kingsville. Absent were Jack Field, Ridgetown, and Stu Anderson, Windsor.

energy field rather than develop new policy.

The study will review the scientific and technical options open to Canada in the energy field. It will include a survey of conventional forms of energy conversion, and an assessment of the role of potential energy technology. Social and economic issues together with environmental effects will also be considered.

Ex-regional manager dies

A. S. Robertson, a former manager of Ontario Hydro's Niagara region, has died. Mr. Robertson held the post from 1948 until his retirement in 1956. He was born in Grey County and joined the engineering department of Ontario Hydro in 1914.

In 1924, Mr. Robertson was appointed superintendent of the new Sir Adam Beck-Niagara generating station and became general superintendent of the Niagara Falls district in 1937. In 1955, he served as a special consultant for the Canadian Niagara Power Company.

Beauty spot is sold

For more than 13 years, various civic groups in Niagara Falls agitated for the development of a 46-acre park in a scenic area just off the Queen Elizabeth Way. Ontario Hydro owned the land and offered it to the township of Willoughby, but at that time nobody could afford it.

Now the dream has come true. Hydro has sold the land to the City of Niagara Falls for $250 an acre, almost the same price as in 1959. Located along the Welland River, the land may be used as a day camp for children and other groups.

Last stop

The Canadian National Exhibition automotive building is the last stop for the Canadian Electrical Manufacturers Association's travelling trade show, Electrical Showcase 73, which is being hauled from Atlantic to Pacific in a special container train designed especially for the show.

The Toronto showing – April 2 to 4 – is being sponsored by the Ontario Electrical League, whose manager, W. L. Scott, says the cross-country exhibitions in five cities are expected to attract more than 26,000 visitors connected with the electrical industry.

Mr. Scott said he expects the show to be of special interest to utility purchasing agents. In addition, two days have been set aside for electrical students in Metro Toronto area vocational

schools to view the exhibits.

The concept of Showcase was born about three years ago when a group of CEMA members felt the electrical industry, second largest in the nation, should have its own trade show. Before that time, electrical manufacturers were being solicited to participate in as many as 30 different trade shows a year.

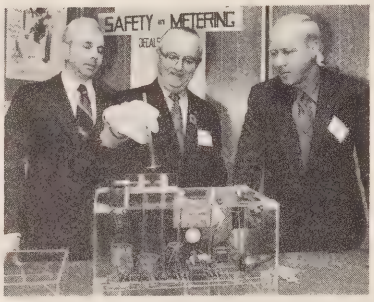
Showcase is an entirely Canadian industrial show. Only Canadian manufacturers of electrical equipment, apparatus and related components are eligible to participate. Among the highlights of the Toronto showing will be a display of electrical artifacts from Ontario Hydro's historical collection.

Metering grows more complex

Future metermen will find their job becoming increasingly complex, D. K. White, president of the AMEU, predicted at the annual metermen's workshop in Toronto.

"I know just enough about the metering art to recognize that the future will demand more highly educated and trained personnel both in the field and in the meter shops," he told 250 delegates at the Skyline Hotel. The attendance was a record for the annual session.

Mr. White commended the workshop committee for its efforts to develop a more formal training course for utility metering people. "Any good business will have capable and well trained people tending the cash register and that is the way I regard an electric meter," he said.



Safety pioneer

He noted that metering equipment is becoming more and more complicated. Pulse-type metering is or will be used by many utilities and metering adaptable to remote and automatic reading will be required as labor costs increase.

Al Macpherson, Toronto Hydro, Horace Walker, Sault Ste. Marie PUC, and Mr. White are seen examining a safety display.

Second plant at Gentilly

Construction will start this year on Quebec's first commercial nuclear power station. To be called Gentilly II, the 600-megawatt station will be built next to the prototype Gentilly I reactor, near Trois-Rivières.

However, the new station will be a heavy water cooled and moderated reactor similar to Ontario's Pickering plant rather than a boiling light water cooled system like the experimental Gentilly I. The federal government is loaning Quebec $150 million towards construction of the station, which is slated to be completed by 1979.

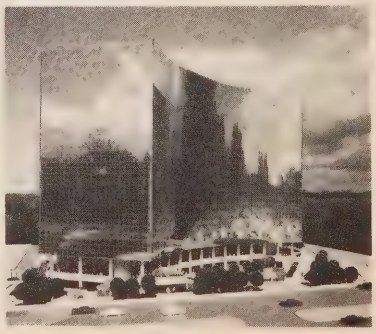
The success of the Canadian nuclear program as exemplified by Pickering has been echoed on the Indian sub-continent where CANDU-type plants in both India and Pakistan are now in service. The station in India was started up in August and the Pakistan plant reached full power in October. Both were built with the assistance of the Canadian government and employed the services of Ontario Hydro personnel during commissioning and training periods.

New head office

Ontario Hydro's new head office building will be one of the most picturesque in Toronto. The 19-storey reflective glass and concrete structure is being built at the southwest corner of College Street and University Avenue in Toronto, next to the present building.

Plans for the office were approved late last year by Toronto city council and the building will take about four years to complete.

To be built by Canada Square Corporation Limited, the new structure will be leased to Hydro at lower than prevailing rates for 30 years, after which it will be owned by the utility. The building will consist of 1,200,000 square feet of floor space and



Nineteen storeys high

will include an attractive shopping complex.

The lease-purchase arrangement was entered into because construction of the power system has priority in the utilization of capital funds. The new head office will accommodate about 5,000 employees now dispersed in eight different locations in Toronto.

Converter passes test

Electric power from the huge Churchill Falls hydro-electric project in Labrador has been successfully transferred to New Brunswick over a solid-state DC converter system which has captured worldwide utility interest.

In a 10-week test, two DC circuits at the Eel River converter station near Dalhousie, New Brunswick, transmitted more than 100 million kilowatt-hours on a regularly scheduled basis. The project uses an AC/DC/AC converter terminal for interconnecting the Quebec and New Brunswick systems, permitting the transfer of high-voltage AC power from Churchill Falls to the AC lines in New Brunswick.

EHV study

A research team from the University of Guelph will conduct a two-year $225,000 study into the environmental impact of Ontario Hydro's high-voltage transmission lines. The results will be used as a basis for determining the type and location of new extra-high-voltage lines.

The first phase of the project will set out general guidelines for the location of transmission facilities. A second phase will develop criteria applicable to specific routes while a third and fourth phase, to be completed by June, 1974, will reassess earlier findings and integrate them into the final report.

Being conducted under the direction of Lari M. Wester, assistant professor in the university's school of landscape architecture, the study was commissioned by Hydro in response to criticism by conservation groups, some municipalities and other members of the public.

"We agree with these groups that Hydro lines should be located and built with minimum effect on the environment and the communities through which they pass," said Hydro Chairman George Gathercole. "It is sometimes difficult to evaluate all the factors that must be considered in selecting new routes. We believe that an outside study will assist in achieving this objective."

municipal briefs

Hilton Brown, a member of Lindsay Hydro for 14 years, has died. He was chairman for three terms and in private life operated a men's clothing store.

Waterloo PUC has changed its name to Waterloo Hydro. The new name was adopted without fanfare so that the utility can fulfill its new duties under regional government with the turning over to the council of the water portion of its operation.

London PUC has discontinued the free hookup of electric stoves and dryers for apartment building owners, but will continue to make connections for appliances owned by the tenant. The service to homeowners will also continue as part of a public relations program. During the first half of 1972 more than 1,450 ranges were connected free by the utility – 1,140 in multi-family buildings.

Port Hope Hydro's new headquarters has been named the Coleman Building in recognition of a father and son, both former managers of the utility. The late Vincent B. Coleman managed the utility from 1930 to 1940. His son, R. A. Coleman, then took over until his retirement in 1971.

Robert J. Reynolds has been appointed manager of Sarnia Hydro following the early retirement of Charles Phelps. Mr. Phelps had been with the utility since 1949. Mr. Reynolds moves from Kingston PUC, where he has been employed since graduating from Queen's University.

One month after friends had honored him on his retirement as manager of Brockville PUC, Henry Little was killed in a traffic accident. Mr. Little had served Brockville PUC for 21 years.



as don wright sees it

It takes a brave man these days to venture any kind of opinion contrary to the views being expressed by the thundering herd of enlightened liberals in matters relating to the common weal.

Flying in the face of all that's holy is the approach being espoused by a group of revolutionary British reactionaries who are suggesting that air pollution isn't necessarily all bad – so long as it comes down evenly. More than this, they have come out foursquare in favor of the effluents given off by the country's generating station chimneys on the grounds that it's good for the cabbages. Or something very close to this.

"Has the world gone mad?" asks the august Central Electricity Generating Board in its prestigious tabloid Power News, "or is it only Britain, with 108 years of experience in air pollution control, over 30 years of experience with flue gas washing, 20 years of country-wide measurements of smoke and sulphur dioxide, and a Clean Air Act over 10 years old, that needs a psychiatrist?"

The point is, or seems to be, that Britain isn't worrying one whit about the amount of sulphur dioxide discharged into the air by industry so long as its chimneys are tall enough to spread the stuff around. Even though that tight little island enjoys something like six times more sulphur fallout than the U.S. on a tons-per-square-mile basis – the heaviest in the world – some parts still aren't getting all that's good for them – or so the reasoning goes.

Power News observes that out of a dozen air samples analyzed in the vicinity of a generating station in the English countryside, five were short of sulphur. "That means," says the tabloid, "in some parts of Britain there is not enough SO_2 for healthy growth of cabbages."

Power people in Britain convey the impression that sulphur dioxide is their industry's gift to the farmer in the form of fertilizer delivered and spread via the smokestacks – and all absolutely free of charge. They tend to view North America's gargantuan effort to reduce the output of SO_2 with astonishment. As Power News puts it:

"Have the farmers of the (U.S.) corn belt – who have to pay 25 dollars a ton for sulphur in the form of fertilizer – asked the Kansas electricity utility to burn coal and supply them with sulphur for free?"

Not ruddy likely, opines the tabloid, which goes on to ascribe American motivation to the firmly held conviction that if a high chimney solves the problem it can only do so by creating another problem far away.

"The fallacy is," the power people's paper points out, "that like most things SO_2 is only poisonous if there is too much of it. When it is sufficiently dilute it becomes positively beneficial."

The story ends with the suggestion that "Readers may now judge who is mad."

Perhaps this is the kind of logic Noel Coward had in mind when he observed that only mad dogs and Englishmen were foolish enough to diddle about in the midday sun. On the other hand, we'd look a little loony over here if we leafed out a lot of lettuce and only succeeded in starving the stuffing out of our cabbages.

■ Anyone who thinks the electrical industry bumps up against the environment only in dull and predictable ways has never been on the receiving end of the kind of oddball items constantly brought to the attention of this column as one might feed nuts to a squirrel. Like the one somebody sent in about the unsynchronized mink.

The problem here arose when the city of Calgary undertook to try out some of the world's most powerful street lamps along a stretch of throughway on the outskirts of town. Overlooked was the fact that 5,000 mink were in residence on a farm within the area affected by the lights. And that's when the fur began to fly.

Like most creatures, mink have their special abilities and theirs must be carefully timed for best results. The farmer raised Cain on the grounds that the powerful lamps would fool the mink into thinking spring had arrived in the dead of winter with catastrophic results. If the mink started acting like rabbits out of season, he claimed, the resultant kits, hairless and as big as your finger, couldn't possibly survive the winter.

Skeptical city fathers said they would find a solution even if it meant keeping the lights off until it was safe to let the mink cavort.

Hydro knows all about mink and even charts the location of mink farms so that its helicopter pilots can give them a wide berth. Unaccustomed noise is enough to cool their ardor and a turned-off mink is not going to pull his weight on the fur coat production line.

■ Poinsettias are something else again and while the technique employed by these familiar Christmas plants to make little poinsettias is quite different from that of the mink – both apparently object to the presence of light at certain times of the year.

This was brought out when a horticulturist recently voiced his dismay at the installation of new street lights along a Saltfleet Township road, near Hamilton. Slower than mink and more subtle, poinsettias insist on total nighttime darkness in which to do their thing and this fellow was understandably anxious with 10,000 plants standing around just looking at each other and shuffling their leaves in embarrassment.

■ And then there was the case of the frustrated Kansas peahen who, cruelly misled by the electrical industry, wasted 28 days of prime brooding time while Mr. Peacock strutted up and down developing a fine case of ulcers.

Finally, the big day did arrive and when the hen left her nest the owner hurried down for the first look at the downy chick. All she found was the egg inscribed with the curious message "60 watts – 125 volts – extended service". The peahen had been sitting for a month on a discharged lightbulb. □

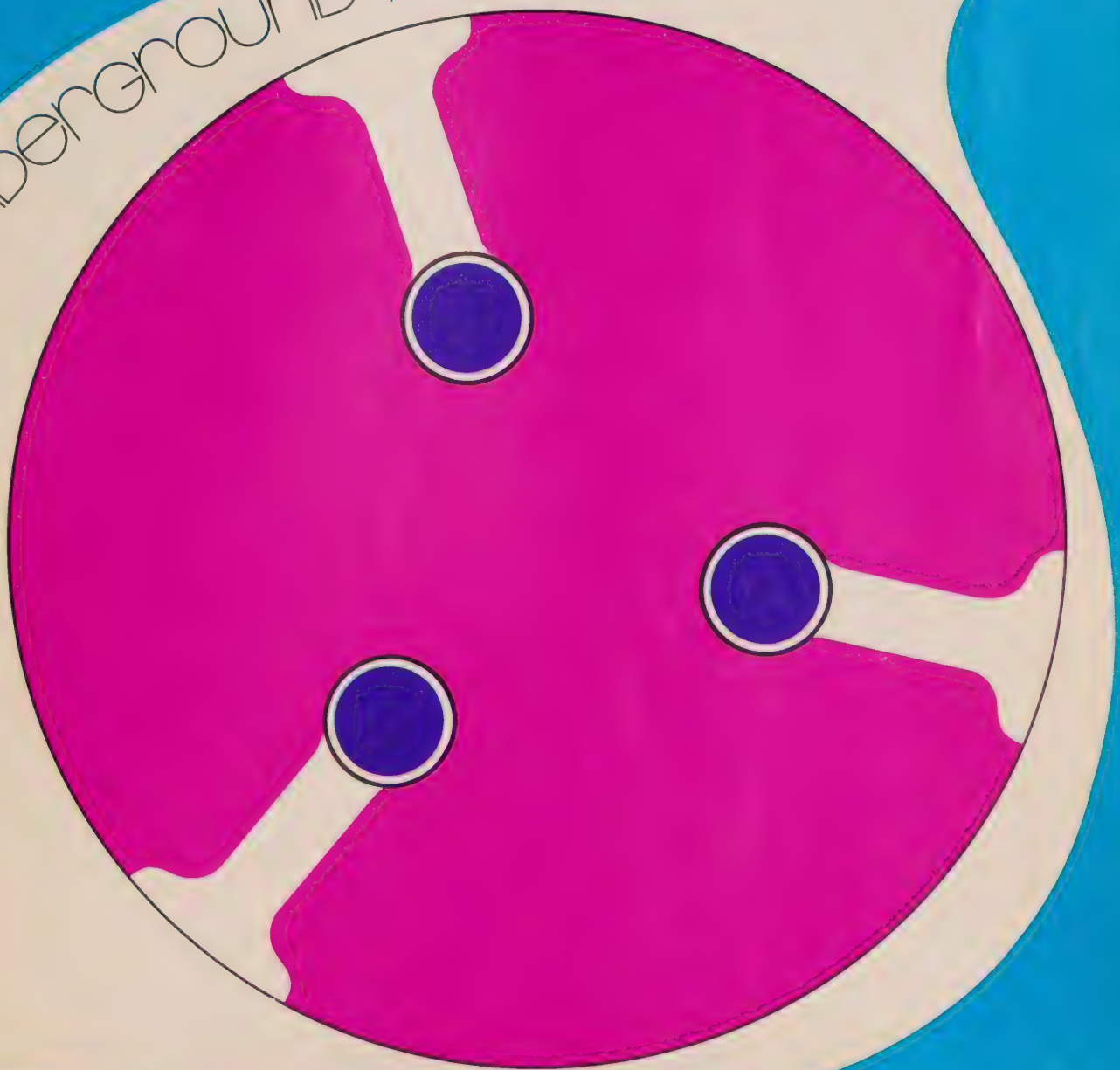
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Some popular misconceptions about underground high-voltage transmission are laid to rest.

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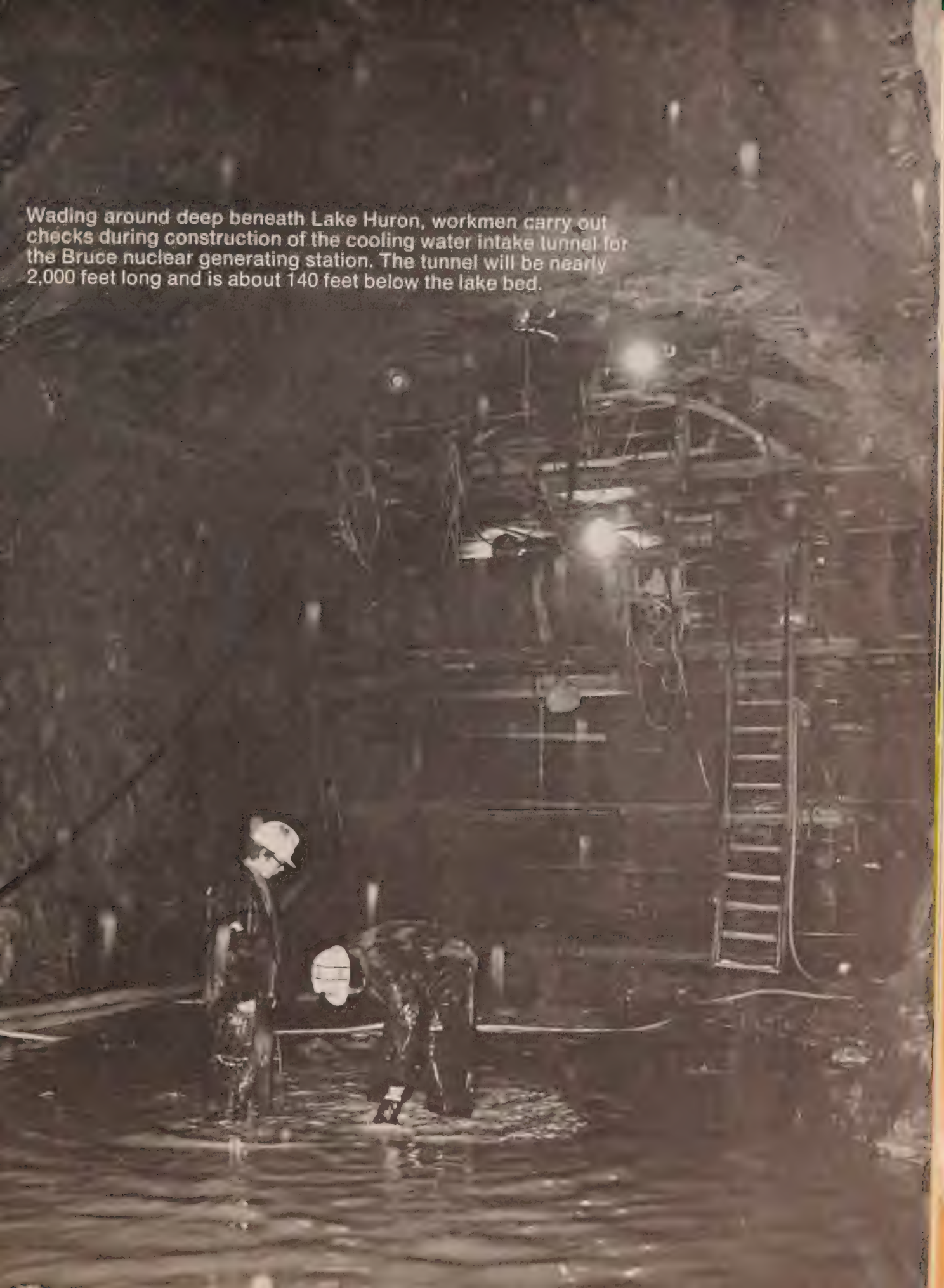
George E. Gathercole, Chairman, Ontario Hydro
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D. M. Seath, President, AMEU
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hydro news, volume 60, number 2

Published by Ontario Hydro, 620 University Ave., Toronto.

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Printed in Canada



Wading around deep beneath Lake Huron, workmen carry out checks during construction of the cooling water intake tunnel for the Bruce nuclear generating station. The tunnel will be nearly 2,000 feet long and is about 140 feet below the lake bed.

taking the heat OFF underground

Hydro engineers inspect SF_6 gas-insulated transformer station in Germany during fact-finding tour. First Canadian mini-station will be in downtown Toronto.



"What's so different about putting Hyd lines underground? Forget about the to ers and bury the cable."

This widely-held view seems plausit enough. Miles of low and high-volta lines are already underground in Onta cities and Hydro appears obstinate in cc tinuing to erect towers.

However, much of the confusion aris over the difference between distributi and transmission lines. A distribution li operates at low voltage over a short d tance whereas a high-voltage transmissi line carries a large amount of energy ov long distances.

Voltage is like water pressure in a pip the higher the voltage, the more push. W increased pressure or voltage, a condu tor (an electrical pipe) carries more a more power in kilowatts. As its size creases, it also carries more current amperes. A 500-kv line, for example, nc mally carries four times as much power a 230-kv circuit and 16 times as much as 115-kv line. Hydro transmits power at 1 230 and 500 kilovolts and steps down t voltage to serve municipal utilities, lar industries and rural customers.

Except during an occasional wind or i storm, nature co-operates with overhe transmission. Essentially all that's r quired are bare conductors and insulato suspended from towers. Air serves bo as an electric insulator and a heat sink.

Such transmission lines operate with high degree of reliability – better than per cent – and a fault usually can quickly located and repaired. On the del side, new tower lines are running in public opposition and high land costs.

Underground, however, is a host environment laced with problems. A tra magazine cartoon which depicts thr culprits called "aggressive soils," "ro ents" and "corrosion" attacking an und ground cable sheds light on a few of t headaches.

Rodent attacks on cable insulation a rare in Ontario but corrosion is a re problem, particularly with aluminum co ductor sheaths which require extrud

(high-voltage cable, that is)

's the utilities' argument that underground cable is costly and unreliable too pat? In this article, Bob Morrow delves into the state of the art of underground echnology and explores the problems and potential of ransmitting large amounts of power underground.



Consolidated Edison used a 520-foot length of 345-kv underground SF_6 transmission line, shown during installation, to avoid overhead line crossover at New York City substation.

olyethelyne jackets for protection. What's more, a U.S. survey shows that lig-ins by man, an industrious burrowing nimal, are responsible for the majority of nderground power interruptions.

One of the stickiest problems con- nected with undergrounding of large ower cables is overheating. Heat builds p in the metal core of the cable as a esult of its resistance to the current, and he heat is held in the cable by the sur- ounding earth.

As well, conductors heat up during peak oad periods and cool off as demands fall, ubjecting cables to continual cycling tress. Unfavorable soil conditions cause hot spots" which can lead to cable failure nd costly interruptions.

To avoid such trouble and increase apacity, two underground transmission nes down the Don Valley in Toronto re- uired nitrogen gas circulation to dissi- ate heat from sections built on garbage ll. Another circuit under the Queen lizabeth Way north of Lakeview Generat- g Station has water cooling facilities to arry away excess heat when loads are igh.

Most of Hydro's high power under- round cables are insulated with oil-im- regnated paper and, to improve their ower-carrying capacity, the three phases f the line are immersed in a pressurized il-filled pipe. In certain installations oil circulated.

Strict quality control by cable manu- acturers and painstaking installation ractices are required to overcome other roblems. For instance, tiny air pockets polyethelyne-insulated cables or the rying out of oil-impregnated cable insula- on will in time cause electrical failures hile contaminants such as dust or metal articles lessen the efficiency of insulat- g gases.

"Each high-voltage underground trans- ission line must be custom-made be- ause of varying soil conditions along the oute and the complexity of design fac- rs," says Robert Murray, a Hydro super- sing project engineer. "This means that e have to do extensive route and thermal surveys before we can draw up specifications for the cable manufacturers. The average time required for design, fabrication and installation is 2½ to 3 years."

Such factors add up to the knottiest, thorniest problems of underground transmission – technical limitations, reduced reliability and high costs.

In the present state of the art, no useful current can be transmitted beyond 26 miles for 345-kv cable and 10 to 15 miles for 500-kv. The power transmitting capability drops rapidly as voltage increases until it is reduced to zero.

The reason is that the inch or so of insulation that separates a high-voltage conductor from the earth becomes an extended capacitor (an energy storage device) that absorbs much of the useful current. As a result the longest underground circuits now in use in the 230-kv to 350-kv range are about 20 miles.

Underground transmission by 500-kv cable is theoretically possible but still in the developmental design stage. Cables at this voltage, about one-and-a-half miles long, are scheduled for service at the Grand Coulee project in Colorado in 1974, but will be relatively low in power-carrying capability.

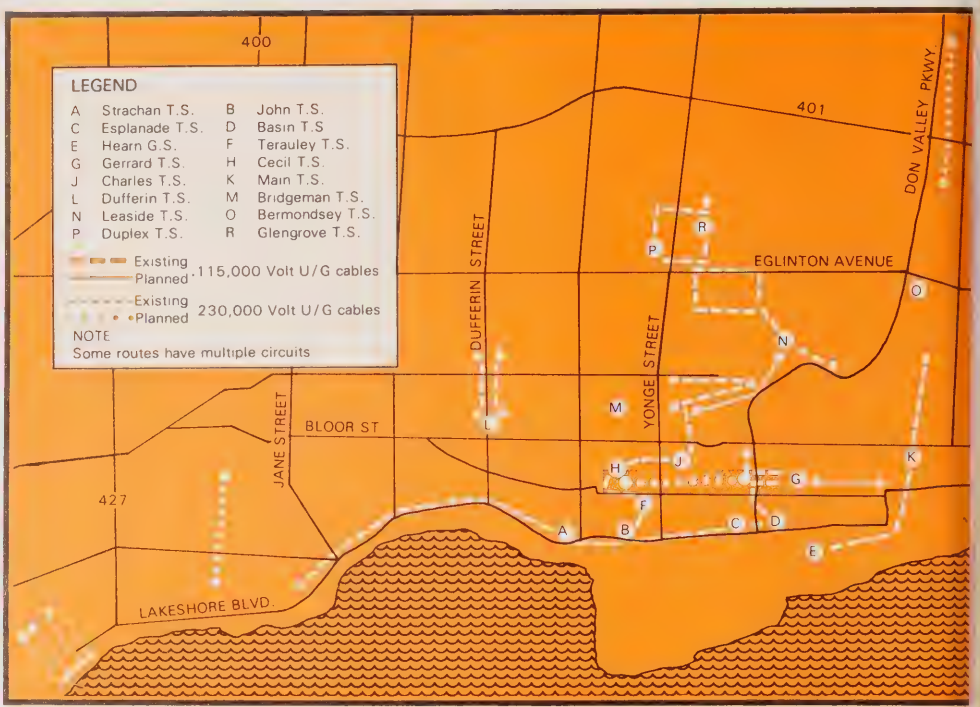
Compensating equipment is available to overcome the capacitance problem but would require expensive stations every five to 10 miles along the cable route to provide charging current.

Although reliability of underground cables is good, access for maintenance and repair is so crucial that lengthy delays in restoring power can result, an intolerable situation on key transmission links.

Costs are so prohibitive that underground transmission has been confined mainly to cities where no other option existed. But, despite high costs, more transmission lines will be built underground as urban centres grow.

Ontario Hydro, for example, has more than 115 circuit miles of underground transmission in operation or projected in Metro Toronto, Hamilton and Ottawa. (See map) In addition, most municipal utilities have installed underground dis-

Dotted lines show existing and proposed underground transmission circuits linking transformer stations in Metro Toronto.



tribution lines in suburbs and downtown areas.

High-voltage underground transmission costs now run about 15 to 25 times as much as overhead lines. Excluding property costs, a single circuit 500-kv overhead line would cost $180,000 a mile, compared with $4.5 million for a mile of underground cable.

Theoretically, a three-circuit underground 500-kv line would require 160 feet of right-of-way, compared with 500 feet for a similar overhead line. This land would have to be cleared of all trees due to risk of cable damage from roots and to avoid overheating because of a reduction in soil moisture.

Such is the present state of technology. Into this situation has been injected a strong sense of urgency, which stems in part from environmental concerns about appearance of overhead lines and competition for open space. It also springs from the requirements of large electrical power systems which will increasingly require high capacity lines to transmit growing amounts of power underground over long distances.

William G. Meese, president of the Detroit Edison Company and member of the U.S. Electric Research Council, told a high-voltage underground transmission conference in Pittsburgh last May that the need was in the same category as controlled fusion and breeder reactors for generating stations. The world-wide nature of the quest was indicated by the attendance of more than 560 delegates from the U.S., Canada, Britain, European countries and Japan.

"Ontario Hydro's interest is primarily in the development of underground transmission systems which will carry up to 4,000 megawatts," says J. H. Waghorne, Hydro's director of research. "Existing types of cables will not carry the amount of power we require to move on our proposed EHV corridor."

In contrast, the Grand Coulee project, first in the world to operate at 500 kv, will carry 15 per cent of that amount. Forced cooling would increase conventional cable capacity only by several hundred megawatts.

The U.S. outlook is indicated in an authoritative article by Andrew F. Corry and A. Sidney Brookes, which concludes: "The day of simple, reliable and economic transmission of great blocks of power for long distances underground is far in the future. It is our hope that every segment of the industry and the general public will support the research and development efforts which are necessary to bring the future nearer."

The first commercial installation of 345 kv pipe cable, 15 miles long, was energized in New York City on May 1, 1964, although short lengths of 400-kv cable had been installed earlier in Europe. But at present less than one per cent of all U.S. transmission lines are underground, mainly in urban areas.

Critics of Hydro overlook the fact that a world-wide search is under way for better ways to transmit power underground. This work involves universities, manufacturers and utility systems. An extensive research program is under way at Waltz Mill, Pa., by the Electric Research Council consisting of 12 representatives fro various segments of the U.S. electr utility industry.

Anton Baljet, a Hydro underground r search engineer who takes an active pa in international conferences, points o that there is a great deal of informatic exchanged between researchers.

"We can't afford to duplicate work th is being done elsewhere but we do kee abreast of it," said Mr. Baljet. "Sever cable manufacturers have major researc and development programs but they a not primarily interested in operational a installation problems. We are vitally inte ested, so we focus much of our effort extending cable life and improving insta lation techniques to gain higher lo capability and better reliability."

The Waltz Mill program includes effo to extend the voltage range of existi insulation systems, particularly oil-i pregnated paper, and to improve th power transfer capability. Long-ran goals include bringing other types cables into commercial use to handle fc to 10 times the loads of existing cabl

continued on page

DAMUT...more than a pipe dream

A concerted effort to break down the cost and technical barriers to underground transmission is under way at Hydro's research centre.

A task force, comprising specialists in the fields of high voltage, heat transfer, oils, chemicals, structural research and economics has been set up to investigate the feasibility of a new concept called DAMUT, which stands for "ducted air-medium underground transmission."

In the future high-capacity underground transmission will probably use a form of gas-insulated cable, as explained in the accompanying article.

However, use of dry air at atmospheric pressure as an insulating medium has not been considered to date by the electrical transmission industry. Such an underground system would have many of the features of an overhead line, and a decided cost advantage.

Preliminary estimates indicate DAMUT might cost three times as much as an overhead line compared to about 15-to-1 for conventional underground.

The concept involves the underground installation of a watertight pipe about eight feet in diameter. Three aluminum tube conductors, one for each electrical phase, would be supported inside the duct by solid insulating spacers.

"We're a lot closer to being able to design DAMUT than a cryogenic system because it's based on existing overhead technology," said J. H. Waghorne, Hydro's research director. Super-conducting systems are not expected to be needed for many years.

One of the main advantages of DAMUT will be that, unlike conventional underground lines, the duct will be accessible for maintenance and repair. This will avert the long delays involved in locating underground transmission faults and restoring power.

The pipe will also shield the conductors from wind, ice, fog and pollution which may cause power interruptions.

However, many problems remain to be solved before a practical DAMUT is possible. These include the choice of material, manufacture and installation of a large-diameter pipe, the desired air quality and a sharp reduction in the clearances between conductors as compared with clearances between overhead conductors.

A. C. "Archie" Tait, manager of the project team, said the first phase of the plan will be studies related to these and other factors.

Several components and a mockup of a DAMUT duct are being tested in Hydro's high voltage lab.

The next phase will involve construction of one or more short lengths of test line in 1973. Initial development work will be on a 230 kv system.

"We are not in a position to make any decisions yet," said Mr. Tait. "Our options are all open at this stage of the study."

The project team is drawing on the experience of representatives from several Hydro divisions and a number of manufacturing companies are co-operating in the project.



Hydro's DAMUT concept involves a large underground pipe with three aluminum tube conductors supported inside an air-cooled duct.

continued from page 4

reducing installation costs and stimulating work on advanced concepts.

Compressed gas insulation is being studied in many industrial and university laboratories while, in Japan, Tokyo Electric Power Company, and two Japanese cable companies are field testing a 500 kv prototype system.

Both programs involve sulphur hexafluoride (SF_6) insulation, which has been described as "the most promising development in terms of high capacity underground systems." Because of their high power transfer capability, SF_6 systems may be technically suited for 500 kv and 4,000 mva, but cost factors are not known at this time.

Three lines of research

Hydro is pursuing three lines of research embracing conventional types of cables, SF_6 systems and a new concept using a large duct containing three conductors with air as the insulating medium.

In the conventional lower power field, polyethylene-insulated cable is coming under intense scrutiny in the Hydro labs because of the possibility of savings in oil-pressurizing equipment which is required for oil-paper cables. However, some years after extensive installations by U.S. utilities, unexpected tree-shaped breakdowns occurred in some cables.

To study the "treeing" problem, Hydro has developed a special high frequency power source in co-operation with two Canadian manufacturers to do accelerated aging tests on polyethylene cable. By using the machine Hydro researchers will speed up the clock and condense 30 or 40 years in the life of a cable into the space of a few months.

"We don't want to run into problems like 'treeing' ", said Mr. Baljet. "Our objective, with any voltage, is to install a cable which will operate for 30 or 40 years and be virtually maintenance free. We can't afford to put in a cable and have it fail in five or 10 years."

Hydro has also been trying to overcome shrinking problems that occur at joints by using moulded instead of taped joints and by pre-shrinking the insulation.

On another tack, gas pressurization tests using SF_6 on a relatively low-voltage polyethylene cable show that voltage rating and reliability can be increased by this method. The highest voltage for this type of cable now used on a U.S. trial installation is 138 kv.

Finding weak spots

Another study in progress deals with the problem of "thermal runaway" which is caused by dry weather and heavy loads on underground cable. Researchers are studying the possibility of using porous pipes to provide a continuous flow of moisture to the soil and increase power-carrying capacity.

To detect weak spots in cable insulation, engineers are applying direct voltages to high-voltage cables already installed. Weaknesses may be found this way without the risk of damage to sound insulation.

But to meet future needs, when larger amounts of power will have to be transmitted underground for long distances, Hydro has studies proceeding in parallel on two promising insulating mediums – SF_6 gas and air contained in ducts.

Worldwide attention

SF_6 systems are now receiving worldwide attention. The first 345 kv installations were energized last year in New York and Cleveland. In both cases short lengths were built to avoid crossovers of existing overhead lines.

In these systems a tubular aluminum conductor is centered in an 18-inch aluminum duct containing SF_6 gas. Three parallel ducts are required to form a three-phase circuit.

Sulphur-hexafluoride gas has excellent insulating and heat transfer qualities, resulting in large current-carrying capacity. Unlike conventional cables, the critical length is hundreds of miles before reactive compensation is necessary for 230 kv and about 100 miles for 500 kv.

Installed costs have been roughly esti mated to run between $3 to $4 million a mile, compared to $4 to $5 million a mil for conventional pipe cables installed i parallel to carry the same load.

Hydro is participating in an SF_6 tes program at 500 kv in co-operation wit I-T-E Circuit Breaker (Canada) Ltd. unde contract to B.C. Hydro involving construc tion of a short length of test equipmer in the Metro Toronto area. The test will precede installation of a 500 kv SF system at B.C. Hydro's Mica generatin station as a link between an undergroun powerhouse and surface termination about 600 feet away.

First in Canada

In addition, Hydro has ordered the firs SF_6-insulated transformer station in Can ada for installation in downtown Toronto It will use special high-voltage switchgea developed primarily in Europe which wi permit a large reduction in space. Th entire mini-station will be enclosed in a attractive building and fed by unde ground lines.

Meanwhile, Hydro has formed a specia project team to consider the feasibility c using a large duct containing three cor ductors with controlled air as the insula ing medium. The development, whic offers considerable cost savings as we as other advantages, is called DAMUT which stands for ducted air mediur underground transmission. (See box fc details).

Supercooled cables

Air- or SF_6-insulated systems woul meet Hydro transmission requirement for some years but, looking farther int the future, supercooled cables may be th answer for transmitting up to 10,00 megawatts on a single circuit.

Two such cryogenic transmission sy tems, which are still in the concept stag would use liquified gases at extreme low temperatures to overcome a condu

or's resistance to current flow.

A resistive croygenic cable system would be cooled to the temperature of liquid nitrogen (–385°F) to increase its conductivity about 10 times. At even lower temperatures close to absolute zero (–459° F), which would be obained by using liquid hydrogen or helium, conductivity can be increased by 500 times.

A 12-year research program to develop commercial super-conducting power ne is under way in the U.S. with funding y the Edison Electric Institute and the .S. Department of the Interior.

To sum up, underground transmission ystems are now so expensive that they re expected to be introduced gradually ver a period of years in relatively few cations. These include high-density eas, exits from large generating stations, crossovers beneath existing transmission lines and dips under major highways and scenic areas.

Certainly much progress will have to be rade in reducing costs to make long distnce underground transmission feasible. ays Robert Murray: "It may be technically possible to build a superhighway nderground but it's not economically ractical to do so. At present, the same i true of EHV underground transmission hes when required for bulk power ansfer."

Thus, for economic and technical reasns, underground can't be considered a anacea for overhead transmission. That's hy Hydro is implementing a new policy d selective cutting of trees, installing ore attractive towers and poles and ndscaping rights-of-way.

Meanwhile, it's exploring promising enues of research which will hasten te installation of more underground ansmission. □

ONTARIO ENERGY MINISTRY proposed by ACE

Creation of a Ministry of Energy to oversee the entire provincial energy field is proposed in the first volume of the Advisory Committee on Energy (ACE) report.

The new ministry would become "the means for the application of a consistent policy approach by the government in regard to the whole field of energy in the province." Ontario Hydro would report to the minister of the new department.

In the event the new ministry is not considered immediately feasible, ACE recommends the establishment of an Ontario Energy Commission whose major responsibility would be to develop and make energy policy recommendations to the government.

One of its functions would be to review, from the standpoint of broad policy, Ontario Hydro's proposals regarding changes in electric power rates, long-range plans, programs and capital requirements for new electric power facilities, and plans for sources of primary energy, including nuclear power.

Shortly after the report was released, Premier William Davis took the first steps toward meeting the proposals by appointing Darcy McKeough as his parliamentary assistant with special responsibilities in the area of energy policy.

Apart from examining the Ministry of Energy proposal, Mr. McKeough will plan the procedures through which the ACE recommendations will be integrated with those of Task Force Hydro.

ACE is headed by Dr. John J. Deutsch, principal and vice-chancellor of Queen's University. It has been studying Ontario's energy requirements and supplies since August, 1971. Ontario Hydro Chairman George Gathercole is a member of the committee, as well as Richard Dillon, executive director of Task Force Hydro. The second volume of the ACE report will give more background to the recommendations.

The report warns that Ontario will face energy shortages and sharply rising costs over the next 20 years unless major new resources are developed. It says there is an urgent need for the Ontario government to develop its own energy policies to protect industry and consumers.

The sharp boost in energy prices will affect both consumers and industry, since the increases will range across the entire energy spectrum from electricity and fuel oil to gasoline and natural gas, the committee says.

continued on page 8

ACE ENERGY PROPOSALS

continued from page 7

The report, prepared before the mid-winter fuel oil crisis hit parts of the U.S., says the Americans will become increasingly dependent on imports of oil and natural gas and, perhaps, uranium. "Inevitably, U.S. energy supply constrictions will, through their effects on international markets, spill over into Canadian and Ontario energy costs."

The report suggests the province will have to achieve an acceptable trade-off between growth and the environment, taking into account direct economic and social costs. The committee did not pursue the issue of economic growth itself, feeling this was beyond its terms of reference. However, in an appendix to the report, Pollution Probe's representative on the committee dissociated his organization from "all those parts of the report that follow from the assumptions that high growth rates in energy consumption will continue for several decades.

"Unquestioned acceptance of extrapolations of demand, from past levels that were continually stimulated by entrepreneurial boosters, is hopefully a thing of the past," Probe states. "Government must by now realize that its mandate includes the right and also the obligation to deal with demand mechanisms."

The advisory committee states that environmental standards such as the introduction of lead-free gasoline, stricter emission controls on smoke stacks and tougher criteria on the location of nuclear and conventional generating plants will add to energy costs and use.

It projects Ontario energy requirements on a high growth economy in which there is an increasing level of affluence and more leisure time, resulting in growing energy consumption.

Between 1950 and 1970, Ontario's requirements for energy grew by 4.2 per cent a year, but this growth rate is expected to accelerate to 4.6 per cent a year in 1970 to 1990. This means that Ontario's energy requirements in 1990 will be nearly 2½ times the energy consumption in 1970.

The report warns that the financial requirements necessary to deal with the energy boom will be substantial, and suggests that Canadian energy investments in the remainder of this decade may require $60 billion, with half going to electricity and the other half to oil and gas development.

Greater attention to energy conservation is urged by the committee, which suggests the province do more research into new energy technologies and increase efforts to make more efficient use of energy in the home, transportation and industry.

Commenting on the structure of an Ontario Energy Commission, the committee feels that provision should be made for the appointment of specialized and citizen advisory committees consisting of representatives of consumers' groups, industrial users, primary energy producers, distributors and groups concerned with environment and conservation.

ACE passes some complimentary remarks on the Canadian nuclear reactor system which, it says, "is now recognized internationally as one of the world's most promising – a reputation which at the time of writing is being confirmed by the outstanding performance of the 2.2 million-kilowatt nuclear station at Pickering.

"The performance of this station to date has not been exceeded by that of any other nuclear station in the world," the report says.

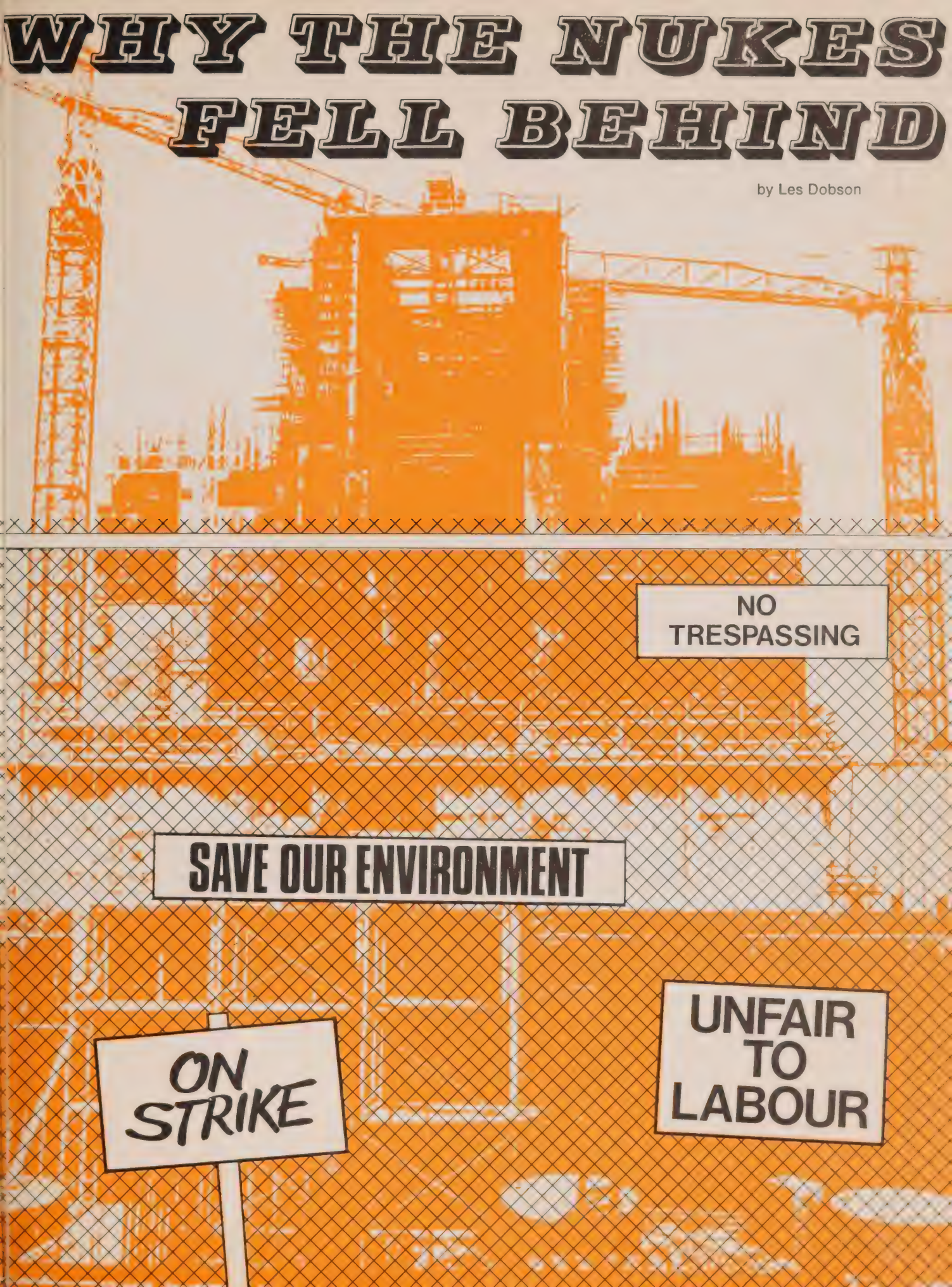
The committee calculates that by 1990 more than half, and perhaps three-quarters, of all the electricity generated in Ontario will come from nuclear power, compared to five per cent in 1971. Over the next 20 years, billions of dollars will be spent on building major new nuclear power plants across the province, it states.

But concern is expressed that exports of Canada's low-cost uranium supplies could leave Ontario short in the future.

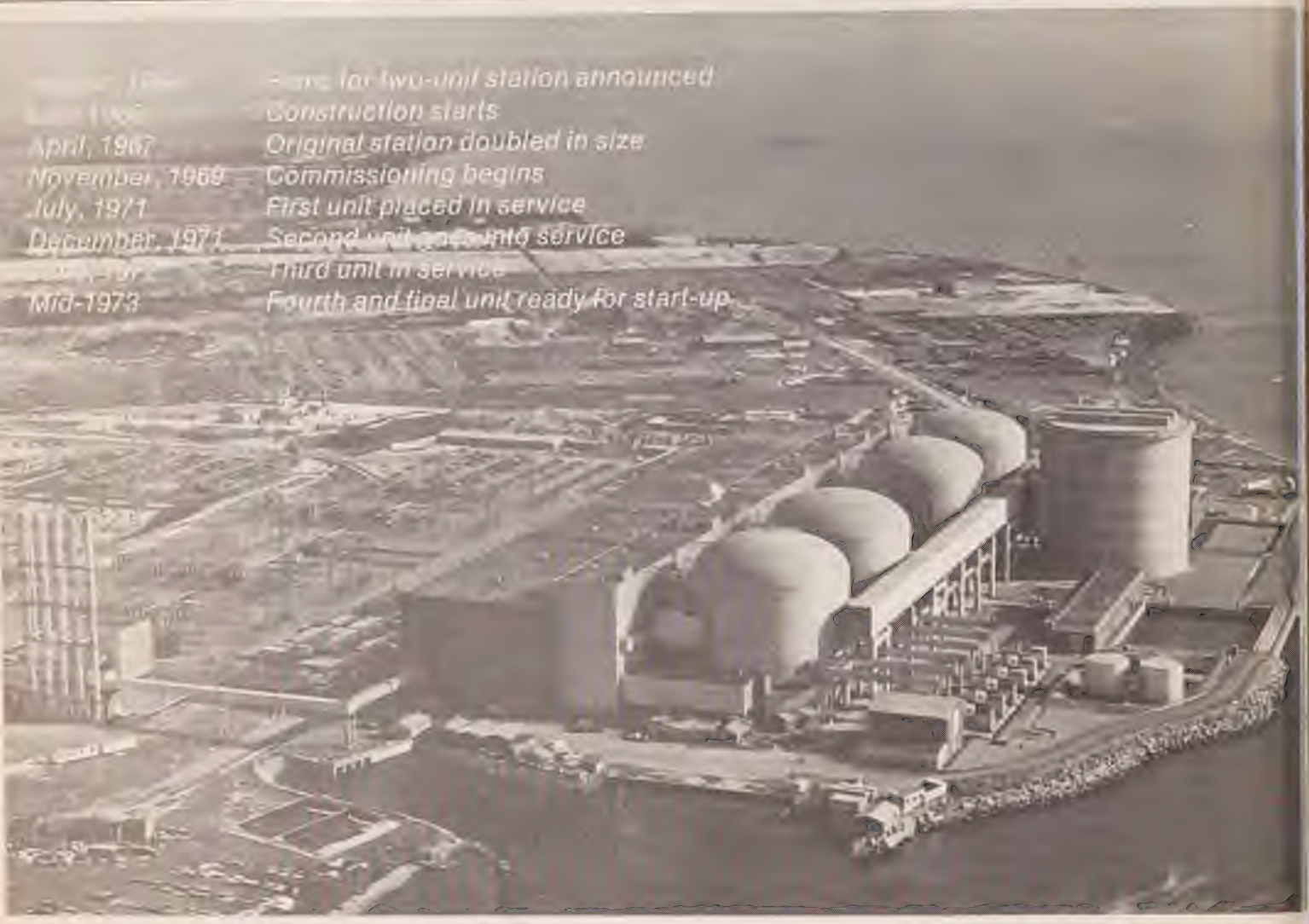
Nuclear power stations built by Ontario in this decade alone will need 75,000 tons of uranium, the report reveals. It urges steps to protect the province's uranium reserves. □

WHY THE NUKES FELL BEHIND

by Les Dobson



Even without abnormal delays from external influences, a modern nuclear station takes about 10 years from conception to completion. Significant dates, below, relate to Canada's Pickering generating station, which has experienced a remarkably trouble-free commissioning period.



Last summer may go down in the history of U.S. electrical utilities as marking the crisis that never was. Despite dire predictions of wholesale load-shedding due to the enormous strain placed on electrical systems by air-conditioning equipment, the network limped through with a minimum of interruptions.

Life in the congested urban areas of Michigan and New York states went on as usual – thanks largely to unseasonable weather. Had the cities sweltered long in 90-degree temperatures, the story might have been different. There's no guarantee the utilities won't find themselves in deep trouble this year, though.

What is happening south of the border, anyway? Why is the world's most technologically advanced nation facing an electric energy crunch that could have serious consequences for the economy?

The most immediate reason is that the U.S. nuclear power program is suffering a series of setbacks spawned by construction and labor problems, licensing delays, the late delivery of nuclear pressure vessels and public opposition to the siting of plants. The industry has a word for it. Slippage.

At present, the U.S. has 28 reactor units licensed and operating, 52 under construction and reactors have been ordered for a further 70. Of the units under construction, the slippage over original target dates ranges from two months to three-and-a-half years.

Worst hit is trouble-plagued Consolidated Edison's Indian Point plant. Construction there has been hamstrung by a lengthy hearing for an operating licence, delays in the delivery of equipment, a disastrous fire on the site last spring and the fact that enriched fuel had to be returned for reprocessing.

"It's difficult to pin delays in the nuclear

rogram on any one factor," said an tomic Energy Commission spokesman n Washington. "Sometimes the schedul- ng was just too optimistic in the first lace."

Throughout the latter part of the sixties, he U.S., aware of an impending crisis aused by dwindling oil and gas reserves, aunched an ambitious program of nuclear xpansion. Between 1966 and 1969, con- racts for 66 nuclear plants were awarded nd the atom was hailed as the one bright pot in a bleak energy outlook.

Then came trouble, and from an unex- ected source. Babcock & Wilcox, one of he most respected and reliable of boiler- akers with experience running from 19th entury steam plants to nuclear submar- es, found that everything went wrong hen they turned to building nuclear pres- ure vessels. B & W set up a $25 million lant at Mount Vernon, Indiana, especially fabricate the huge steel pots – some of em weigh more than 800 tons – that con- in the nuclear reaction.

But, plagued by labor shortages and alfunctioning machines, the plant re- ortedly produced only three pressure essels in its first three years of operation. 1969, according to an article in Fortune agazine, the company disclosed that very one of the 28 pressure vessels then the Mount Vernon works was behind chedule, some by as much as 17 months.

While the ripples from this disclosure ere still washing over the nuclear industry, other pressures were rapidly mounting. Environment, ecology, the eco- system, spaceship earth became key words on everyone's lips from the univer- sity campuses down to grade school. Not only the academics but the public at large were swiftly becoming disenchanted with the electric utilities.

Thermal discharge became a popular issue, perhaps because it is easily visual- ized. But nuclear safety also entered the controversy and radiation hazards were widely touted, despite the assurances of the experts. More recently, yet another argument has surfaced, this time center- ing on emergency core cooling – the mea- sures taken to prevent a reactor melting in the unlikely but possible event of a com- plete breakdown in the cooling system.

Canada's reactor system employs heavy water as moderator and coolant in two distinct and separate circuits. Emergency cooling is accomplished by introducing heavy water from the moderator circuit into the zircaloy tubes surrounding the fuel elements.

This is not possible in the American system, which uses light water in a single circuit to both cool the reactor and mod- erate the chain reaction. Instead, water would be sprayed through ports around the reactor on to the fuel elements. Trouble is, certain experiments have shown the pressure inside the reactor may tend to restrict the influx of cooling water.

While there may be doubts in even the minds of some nuclear experts about the complete safety of U.S. reactors, the fact remains that most of the public criticism is based on misinformation and miscon- ception. And it is here that the utilities themselves are mainly to blame.

Many of them failed completely to rec- ognize, or take seriously, the subtle changes taking place in public sentiment throughout the sixties. Few information offices succeeded in getting the industry's problems across to the public, contenting themselves instead to issuing news re- leases on company appointments, plant dedications, retirements and the like, most of which ended up on the editor's spike. In many cases, information officers were forbidden by management to even dis- cuss some of the more controversial sub- jects. To many utilities, the word pollution didn't even exist.

Similarly, the media had no faith in the quality of information provided by the utilities. Even today, they look upon hon- est efforts to explain such difficulties as sulphur dioxide removal and underground high-voltage transmission with a jaundiced eye.

One study at the University of Wisconsin set out to determine whether newspapers available to people living near the sites of selected nuclear plants did, in fact, pre- sent and interpret the major issues. Among the conclusions, it was discovered that local and regional papers did little or nothing with topics like site selection,

citizen participation and cost of an improved environment. Policy matters got virtually no attention, except by the New York Times.

Because of a dearth of good science writers, able to recognize and present technical stories for mass consumption, this information gap persists. True, many technical articles appear in the trade journals, but these reach a limited audience and amount, in effect, to the industry talking to itself.

This lack of public understanding has only served to aggravate an already serious problem and the situation is taking on crisis proportions in some centres, notably the city of New York.

William K. Jones, of the State Public Service Commission, said in a report last year that New York City "cannot hope to survive" without drastic economies in the use of electricity. Mr. Jones proposed a suspension on all new buildings until Con Ed is assured of adequate energy to meet the needs of the city and lower Westchester County – a prospect not likely to be realized before 1975 at the earliest.

The only exceptions to the ban would be hospitals, schools, and low-cost housing, and even these might not be exempt. Both the city and Con Ed have embarked on a "Save a Watt" campaign to try to curb consumption. Delays similar to those affecting Con Ed have caused industries in other urban centres to threaten to move if they cannot get adequate power supplies.

Most people in the industry agree that licensing delays reached a climax with the so-called Calvert Cliffs decision in July, 1971. Applications involving more than 90 reactors were held up by this court ruling, virtually stalling the entire U.S. nuclear program.

Calvert Cliffs is a nuclear power station being built by the Baltimore Gas and Electric Company on Chesapeake Bay, Md. New rules affecting the construction of nuclear plants had been introduced under the National Environmental Policy Act. These included the filing of a detailed statement on the environmental impact of each plant. The Atomic Energy Commission proposed that the rules not take effect before March 4, 1971, but a group comprised of the Calvert Cliffs Co-ordinating Committee, the Sierra Club and the National Wildlife Federation filed suit over this interpretation. Judgment stipulated that the new regulations would affect all stations not licensed for operation as of January 1, 1970.

The ruling was a body blow to the nuclear program, which began to roll again only in late 1971. Estimates of the cost of the delay vary considerably, but Howard M. Winterson, president of Atomic Industrial Forum, a non-profit organization concerned with the peaceful application of nuclear energy, put the cost of a year's delay in licensing nuclear plants at between $5 and $6 billion. The cost includes carrying charges on plant investments, incremental increase in the cost of replacement power and commitments to fossil and gas turbine capacity.

"Regardless of the exact figure," said Mr. Winterson, "the magnitude is overwhelming."

What, then, of the future? Does it hold more of the same?

There are signs that the strong tides of environmentalism are ebbing in the U.S. and that construction of proposed nuclear stations will begin or resume as time-consuming environmental impact studies are completed. However, it should be recognized that eight or nine years elapse between commitment and operation of a station. Many people, including the more responsible environmentalists, fear a backlash from consumers deprived of light, heat and possibly their livelihoods.

The Sierra Club took a moderate attitude toward energy growth and made no special opposition to nuclear power at a recent two-day meeting in Vermont. Indeed, the chairman of the club's energy policy committee was quoted by the New York Times as saying: "We've been considered irresponsible for too long. We're now at the point where we don't want to be in the position of arbitrarily blocking every new electric power plant that comes along."

And Dr. Ralph Lapp, the physicist and science writer, has said he is concerned about a backlash in five or 10 years that would see the nation begging utilities to build more nuclear plants faster.

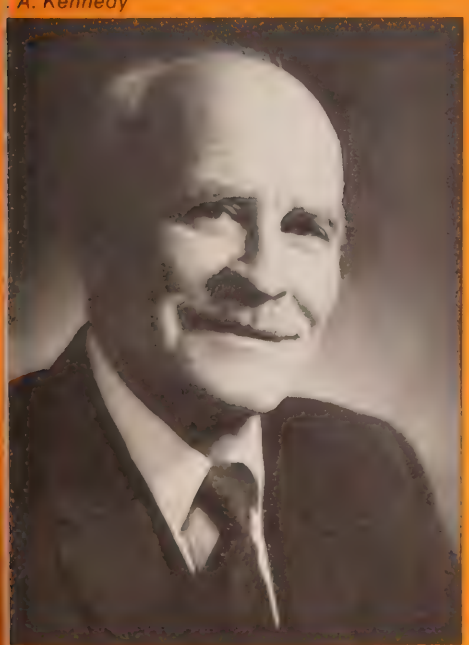
Such a situation could put as much strain on the electric utilities as does the public disenchantment of today. □

canadian tire boss new commissioner



J. D. Muncaster

. A. Kennedy



A man who in six years rose from the position of Canadian Tire store manager in Sudbury to become president of Canadian Tire Corporation has been appointed an Ontario Hydro commissioner.

J. Owen Muncaster, 39, replaces Lt.-Col. A. A. Kennedy, who has retired after nearly 16 years on the Commission.

Mr. Muncaster is well suited for his new position . . . he is steering committee chairman for Task Force Hydro created in 1971 to review the objectives, function, structure, operations and financing of the Hydro organization. He was born in Sudbury, received an honors B.A. in Business Administration at the University of Western Ontario in London and a Master of Business Administration degree at Northwestern University in Chicago.

In an interview last year, Mr. Muncaster said that "Task Force Hydro is giving consideration to mechanisms which will ensure an electrical generation and distribution system responsive to government policy, encompassing a broader range of issues than has been normally recognized in the past.

"As we move into the future considering the size and potential of Ontario Hydro's influence on the social and economic patterns of this province, it becomes evident that increasing numbers of policy issues facing the provincial government are also issues facing Hydro.

"It is government's role to ensure that all the issues are taken into consideration in establishing a consistent coherent policy capable of implementation.

"As I see it, Hydro's role is to provide the necessary input and 'expert' advice upon which policy can be based and to produce and distribute electrical energy in support of this policy. The development of policy thus becomes a joint effort which is satisfactory to both."

Lt.-Col. Kennedy was a member of Owen Sound PUC for about 20 years, serving as chairman for several terms. He is a past president of the OMEA and the Georgian Bay Municipal Electric Association. He also took an active part in the preparation of the Hydro Hall of Memory at Niagara Falls and has a continuing interest in Hydro's historical collection.

Born and raised in Owen Sound, Colonel Kennedy is both a distinguished soldier and a prominent businessman. During the Second World War he commanded the Hastings and Prince Edward Regiment, serving in England, Italy and Northwest Europe, and was awarded the DSO for gallantry in action. He is also a former officer of the Grey and Simcoe Foresters, becoming its commanding officer after the Second World War.

His business career began as a foundryman in the family firm of William Kennedy and Sons in Owen Sound, and for years he was recognized as a sales specialist in steel castings and propellers.

Colonel Kennedy is a member of the Military Institute, a past president of the Canadian Legion in Owen Sound, and a past chairman of the Research Committee of the Steel Castings Institute. His interests include sailing, curling and public life.


OLD KING COAL
STAGES A COMEBACK

by Bill Settatree

Large-scale coal gasification plant in Chicago may help to open up new vistas in the energy field. Developed by the Institute of Gas Research, the Hygas plant converts coal to pipeline-quality gas. Left, Ontario Hydro's unit train loads up at Grant Town, West Virginia.



Criticized by environmentalists and stymied by tough government legislation on mining practices, the U.S. coal industry is nevertheless enjoying an unprecedented comeback.

The boom is being fed by a growing shortage of energy resources such as natural gas and oil, delays in the U.S. nuclear power program and continuing increases in electrical demand. It's estimated that by 1980, the U.S. will require more electricity than the rest of the world consumes today.

Both in anticipation of the start-up of several nuclear plants and to make modifications to meet strict mine safety regulations, U.S. coal companies cut back production in the 1960's. Then delivery, construction and licensing problems began to plague the nuclear program, creating an unexpected demand for coal. Prices skyrocketed more than $3 a ton between 1968 and 1972.

The effects were quickly felt in Ontario, which imports all of its coal. Last year, Ontario Hydro alone burned 8½ million tons of U.S. coal at a cost of $103 million.

Ironically, in spite of short-term scarcities, coal is still the most plentiful of all the fossil fuels. Estimates of U.S. reserves vary widely, but there is probably sufficient for at least 500 years at present rates of consumption. Coal's main disadvantage: it's the least acceptable fuel from an environmental standpoint.

Quick to realize this, industry scientists have embarked on a number of projects aimed at developing an economic means of gasifying coal, then piping it to the customer. "It's much easier to remove environmentally objectionable constituents such as sulphur from coal gas than it is to remove them from flue gases after combustion," says a Toronto consulting engineer J. L. Haydock. Most of the advanced gasification processes under development will be able to convert more than 90 per cent of coal's sulphur content to hydrogen sulphide, he says. From there it's a relatively simple step to obtain elemental sulphur.

Mr. Haydock suggests the concept of coal gas-powered combined-cycle combustion turbines is a feasible alternative to present methods of thermal-electric generation. In combined-cycle units, gases expand upon combustion to drive a turbine-generator. Waste heat is trapped to create steam, which in turn drives additional turbine stages.

"On the whole, the concept represents one of the brightest hopes on the electric utility horizon, and the goal may be reached within the next decade provided enough effort is put into the program," Mr. Haydock adds. He warns, though, that utilities are deluding themselves if they think overall gasification costs will be competitive with current fuel prices.

Two basic approaches to gasification are under study. One involves the production of synthetic natural gas or methane, which could be transmitted by pipeline over long distances at low cost. Methane has a high heat content (about 1,000 BTU's a cubic foot) and is very clean. The second approach is to manufacture an environmentally clean low-BTU gas at prices low enough to make it attractive as a fuel for major power plants. To render such a project economic, power plants would probably have to be located at the mine mouth to cut transportation costs. Under the first scheme, high-sulphur bituminous coals would be used while lignite might lend itself to gasification as a fuel for generating stations.

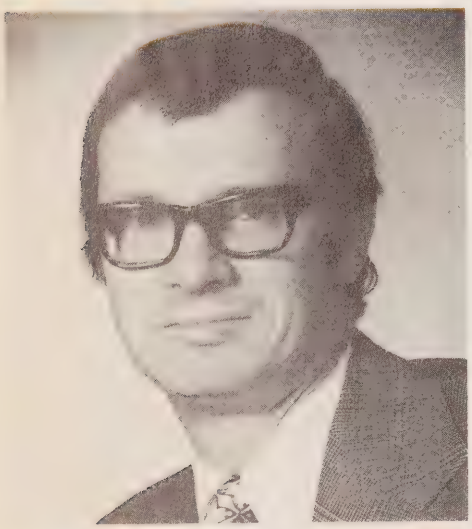
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Hydro still needs coal

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Ontario Hydro's fuels purchasing agent J. L. Cooke says the provincial utility will rely on coal indefinitely. One of the reasons is that fossil-fuel plants provide flexibility in meeting power demands because of the ease with which they can be started up or shut down.

Hydro's requirements account for about half the coal imported into Canada each year from the United States. The coal comes from Pennsylvania and West Virginia. It is delivered by train to the Lake Erie ports of Ashtabula and Conneaut, Ohio, from where it is transported across the lakes by boat.



J. L. Cooke

Storage facilities at these American ports were built primarily to serve Hydro. Coal is dumped directly into underground hoppers and then it is moved by conveyor belts either to a storage pile or into the hold of a boat. The trains can unload 3,000 tons of coal an hour.

Last year Hydro went into the railway business because of a shortage of rolling stock in the U.S. The utility began operating a 75-car unit train to transport coal from the West Virginia mines to the lake ports. Mr. Cooke says the equipment is being rented on a 15-year lease and the program currently is so successful "we are making money at it." Additional leasing is being considered.

The cars are moving about 600,000 tons of coal a year – enough to supply all eight units at Nanticoke generating station, now under construction on the opposite shore of Lake Erie, for 400 hours at full capacity. Mr. Cooke says the car shortage materialized partly because of financial problems plaguing U.S. railroads. The Hydro train runs on lines owned by the now bankrupt Penn Central.

By leasing its cars and running them steadily, Hydro is getting a preferential rate which more than offsets the cost of rental. Such economies are welcome. It costs more than $7 million annually to ship coal across the lakes.

Hydro burned 8,400,000 tons of coal at a cost of $110 million last year. While this seems a staggering amount, consumption was down 1 million tons from 1971 due primarily to the conversion to gas of the R. L. Hearn generating station on the Toronto waterfront. Other factors contributing to the reduction were high water levels, giving increased hydro-electric output, and the contribution of the first three units at the Pickering nuclear station.

Between 1968 and 1971 the price of coal to Hydro jumped about 25 per cent. Mine safety regulations alone added $1 a ton to the coal bill. In 1970, a severe shortage materialized in the U.S. That year an estimated 300,000 tons of western lignite were bought to augment fuel supplies and additional purchases were made in 1971. The western coal cost Hydro 20 to 40 per cent more per million BTU because of its low heat content.

Mr. Cooke says there's no difficulty now getting good quality coal and Hydro is relying on high stacks and other control devices to remove pollutants.

However, at the Lambton station near Sarnia, a 10-year contract for the supply of premium low-sulphur coal is still in effect and half a million tons are burned there annually. Mr. Cooke explains that this premium coal is burned there during the growing season and in certain adverse weather conditions. Low sulphur coal adds another $3 a ton to fuel costs. □

Both General Electric and Westinghouse Corporation have announced plans to make coal gas with a heating value of about 130 BTU's a cubic foot. This is about one-third as high as the domestic gas which once illuminated North America's streets and was used in Toronto by Consumers Gas Company until natural gas became available in 1955 following the Alberta discoveries.

At the present time, there are 16 pilot gasification plants in operation or nearing completion in the U.S. toward which the government has contributed $25 million.

Certainly, with an energy crisis looming on both sides of the border there's every reason to investigate gasification methods. The American Gas Association told a Senate sub-committee recently that "the establishment of a domestic coal gasification industry would create economic growth factors across the country and a significant supply of supplemental gas would reduce our dependence on foreign sources of energy."

Efforts by three U.S. pipeline companies to buy Canadian gas in 1971 were blocked by the National Energy Board in an effort to guarantee Canadian reserves for 30 years.

Coal seams are the result of the accumulation of organic matter over a period of several million years in lagoons and swamps similar to present-day peat bogs. Peat, in fact, is the first step along the road to coal and is burned today in thermal-electric stations in Ireland. Gradually, the pressure of overlying sediments and rocks turned the great peat bogs of prehistory into various forms of coal – the greater the amount of water forced out, the better the quality.

In the western world, coal was first used on a serious scale in 13th century England as the forests became denuded and supplies of firewood began to run out. As early as 1255, Eleanor of Aquitaine moved from London to Nottingham "because of the insufferable smoke." Soon after, Parliament prohibited the burning of coal in London

But as the industrial revolution gath-

Coal boats discharge their cargoes at Lakeview generating station, west of Toronto. Two conveyor belts with a combined capacity of 5,000 tons an hour carry the coal from unloading dock to stockpile. Operating at full load, the station consumes 824 tons of coal an hour.



ered momentum, coal came to play an increasingly significant role. It fuelled the furnaces of the early iron foundries and later, through the medium of the steam engine, opened up new frontiers in new lands.

Today, coal's main role is still that of a fuel. But it also yields a cornucopia of by-products from artificial sweeteners, flavorings and dyes to perfumes, paints and resins.

Ontario is peculiarly devoid of coal deposits, although this was of little consequence to the economy in the days when there was sufficient hydro-electric power to meet the province's demands for energy. Those days are now past, and Ontario Hydro relies heavily on imported coal – a reliance that will diminish somewhat with the continuing development of nuclear energy.

Large deposits of lignite – a substance halfway between peat and coal – have been established at the Onakawana field to the south of James Bay near Moosonee. Various schemes to develop the deposits, which occur in two sprawling seams 60 to 130 feet below an overburden of muskeg, clay and glacial sand, have been mooted over the past decade. The most recent, and the one which appears to have caught the public imagination most, would be the building by private industry of a lignite-burning power station on the site.

Unfortunately, lignite's attractiveness as a lower-sulphur fuel is diminished by its low heat content. Various lignites yield between 5,000 and 7,000 BTU's a ton compared with 13,000 BTU's for good quality bituminous coal. To be efficient, a lignite-burning power station requires specially

designed boilers and auxiliary equipment while transportation costs pose another problem. Lignite contains up to 48 per cent water, making the economics of hauling the fuel long distances dubious to say the least. Hence the desirability of an on-site power plant.

Throughout much of 1970 and 1971, Ontario Hydro conducted a series of experiments involving lignite from both the Onakawana deposits and Saskatchewan at the 100,000-kilowatt Thunder Bay generating station in Northwestern Ontario. A number of problems were encountered and further tests, preferably in a special furnace, would be necessary to evaluate the fuel's potential.

Meanwhile, researchers are urging the coal industry to look at alternatives to the traditional methods of mining coal and transporting it to the customer. Dr. S. M. Farouq Ali, professor of petroleum and natural gas at Penn State University, believes the economic picture has changed sufficiently to warrant a fresh look at the gasification of coal underground.

"In coal," he says, "we now face a vastly different situation than we did some 20 years ago, when underground gasification was experimented with in Britain and the U.S. and discarded as uneconomical. Mining costs have skyrocketed. The health and safety of miners are more on the public conscience, and the pollution generated by conventional methods of mining and utilizing coal – smoke, dust, fly ash, scars on the land – are of national concern."

Dr. Ali underscores the main problem with underground gasification: that the gases generated are of low heating value and would require special turbines for economic operation. His suggestion also raises the possibility of developing coal seams at present inaccessible to modern mining machinery.

One possibility investigated by Hydro to utilize western coal reserves would involve transporting a slurry of coal and oil by pipeline. Such a slurry could be burned as a mixture or the two components separated again at their destination.

Way-out as such ideas sound, they suggest that the much maligned coal industry is a far cry from being written off. The fuel on which the industrial revolution was built may, in fact, be on the verge of a revolution of its own. Any way you look at it, Old King Coal's crown may have slipped a little, but he's still well and firmly settled on the throne. □

Hints of Nixon plan to boost mines

Major shortages of gas and oil in the U.S. this year have added to the growing interest in coal.

Cutbacks were ordered in fuel deliveries in some areas as a cold spell struck the midwestern states in January. Office buildings turned back their thermostats, schools were closed from lack of heat and even some residential areas were cut off. Industrial cutbacks resulted in layoffs.

In the midst of the crisis, there were strong indications that President Richard Nixon would call for the conversion to coal of many oil-fired generating plants. Proponents of the plan feel that reliance on the massive U.S. coal reserve for the next 15 years would be better than stepping up oil imports. Apart from the inflationary aspect of such imports, the U.S. wishes to avoid the security risks of depending on foreign powers for substantial energy supplies.

Under the scheme, the president would call for incentives to revive the ailing coal mining and railway industries. Included would be relaxation of pollution controls to permit coal burning on a larger scale, and increased strip mining. Both are vigorously opposed by environmentalists.

The President's Office of Emergency Preparedness has drafted several coal-use plans. One apparently suggests that selective and temporary relaxation of some state air pollution control standards could result in savings of 2.2 million barrels of oil a day.

Last October, the same office recommended that large energy users pay a premium for their fuels, thus reversing the present philosophy that volume buying reduces the unit costs. The OEP claims that large industrial users consume 30 to 40 per cent of all energy produced in the United States.

The energy crisis and spiralling costs have also propelled manufacturers into taking a closer look at managing their energy. Several corporations have set up divisions to control energy waste in their plants or are engaging energy consultants. One company recently learned that it was able to save $500,000 a year by controlling steam leaks from its boilers. □

THE STUDENT DILEMMA

by Sheila Kenyon



Ontario's universities are still recovering from a bombshell last fall when 9,000 students fewer than expected showed up on campus.

Projections had indicated an increase in enrolment of 8 per cent. In fact, the overall increase was a slim 1 per cent . . a far cry from the average 11 per cent increases common in the sixties. Many institutions registered fewer students than the previous year and the seriousness of the situation is evident in slashed budgets, curtailed building plans and a surplus of teaching staff.

Reasons for the dwindling number of students vary – the phenomenon started in Western Canada about two years ago – but a combination of economic factors and disillusionment with the higher education system are frequently cited.

The province's 22 community colleges, on the other hand, experienced an influx of nearly 40,000 full-time students, an increase of 13 per cent. Although not up to expectations, the increase about equalled that of the previous year.

Broadly speaking, the universities and community colleges represent two different educational philosophies. The former are geared to training "all-round" men and women, with a great deal of emphasis on the theoretical. The latter are intended to train people to take a specific job in society and fit right in.

Undoubtedly, the increasing momentum of what Alvin Toffler calls the super-industrial age is putting great strain on the educational system. Many universities are having to rethink their approach and the days of processing large numbers of

arts and science students in sausage machine fashion are probably numbered. As William Twaits, chairman of Imperial Oil, told the Canadian Education Association: "We are not producing disciplines in the proper mix or volume for the needs of society in the course of technological and social change."

When he announced the establishment of community colleges in 1965, Premier (then Education Minister) William Davis said: "In this new age of technological change and invention . . . it is essential to the continual growth and expansion of the economy of our province and of our nation that adequate facilities be made generally available for the education and training of craftsmen, technicians and technologists."

Unfortunately, the explosion of knowledge makes it difficult to train people for specific jobs. However, J. W. Hazelton, of the Ministry of Colleges and Universities, says community colleges are answering the challenge by producing "men and women with enough basic skills to be immediately employable."

"With sufficient basic training in science and math, they can develop on the job. Ten years from now, the skills that made them immediately employable will be outdated, but their knowledge of math and science will enable them to update," he said.

Gordon McHenry, Ontario Hydro's director of labour relations, blames much of the present disillusionment with the universities on the failure to relate education levels to the real needs of society.

"If the gap between the level of education and the social and economic utilization of the acquired skills is great, dissatisfaction, disillusionment, unrest and psychological disturbance follow inevitably," he says. "Career realization must have a reasonable relationship to career expectation."

In other words, people are not going to invest time and money on university courses if they cannot get a worthwhile job at the end of it all.

Mr. McHenry feels the education system must gear itself more to turning out practical people than theoreticians. "The facilities and resources of our education institutions must be devoted more to the development of doers than thinkers. Teachers, who are primarily philosophers or researchers, should recognize that society is not best served by moulding all students in their likeness."

Predicting a subtle shift from the accumulation of knowledge to its utilization, Mr. McHenry adds: "Over the next couple of decades, the emphasis must be on the application of what we know to social, environmental and ecological improvement."



Gordon McHenry
Need for more practical people

An electrical engineer by profession, Mr. McHenry believes the universities should turn their attention to the training of technologists as well as engineers. Many professional engineers are underemployed, he says, because they are doing a technologist's work, and a proper mix in industry might be four technologists to each engineer.

A five-year course with more emphasis on the humanities, social sciences and business techniques would allow the professional engineer to assume a more appropriate role in society, says Mr. McHenry. Other curriculum changes should orient the engineer more toward the application of knowledge and less toward research.

As far as the knowledge explosion is concerned a number of teaching techniques are being introduced at the trade, technologist and university level which should help educators to cope with changing circumstances.

One such innovation is to set up the education program in modules or blocks that can be switched around or updated as technology changes. Ontario Hydro is using modules in a number of training programs, including the teaching of nuclear power technologists and technicians. Similar systems are being developed elsewhere.

Hydro's modular system evolved from a general training program started in 1960. Utilizing modular training, the knowledge needed by various categories of technical personnel working with nuclear power has been divided into blocks of training. Some modules may be common to a number of job categories. Classroom or on-the-job training can be incorporated into the different blocks.

The three main categories of technical people working in a nuclear station are: nuclear operators, control technicians and mechanical maintainers. A new employee undergoes an initial eight-month training program at Hydro's nuclear training centre at Rolphton, Ontario. Technical staff, including physicists, chemists, engineers and technologists, go back to the classroom to add the module of training particular to their job requirements.

"The advantages of modular training is that as technology advances we can immediately update and change the training content of any of the modules," says W. J. Patterson, manager of technical and administrative manpower.

Rolphton serves as a training centre not only for staff operating the Pickering nuclear station and for personnel at the new Bruce nuclear power plant, scheduled to start up in 1976, but for people

Practical training and classroom sessions under way at Ontario Hydro's Conference and Development Centre, near Orangeville. Located on 200 scenic acres, the centre provides a secluded atmosphere in which employees are taught new trades and management skills.





from other utilities overseas who require nuclear training.

Sixty per cent of all new Hydro employees are hired into training and development programs. Hydro also operates a development and conference centre in the Hockley Valley, near Orangeville. The centre, located in 200 acres of parkland, provides facilities for trade and technical training, outdoor training in forestry, line construction, municipal street lighting and residential and underground distribution systems. Seminars and training sessions are held for management and supervisory personnel.

An interesting development from the modular training program is a pilot project involving electrical trade students in four high schools in the 1972-1973 academic year.

"We're breaking down the training needed by electricians working as linemen and station electricians. Going from the top category, we're asking ourselves what these people need to know to perform their jobs. We're analyzing each job area down to the needs of new employees. Now we can better decide what potential employees should be learning in school," says Mr. Patterson.

"As a result of this job-knowledge breakdown, we are suggesting subject material to be taught in the class during the school year. During the summer, the students can apply what they've learned in the classroom working for Hydro."

If the pilot project is successful, Hydro will consider similar high school programs for mechanical maintenance personnel, linemen and foresters.

"This type of program would eventually represent a cost-saving to us in the training of new recruits and provide young people with potential knowledge and make them more employable on graduation," Mr. Patterson adds.

R. H. Nicholson, Hydro's director of manpower resources and development, says:

"Due to its commitments to produce trained personnel to meet technological advances, Hydro is probably one of the most advanced organizations in its field and necessarily invests considerable money in education. It always will because of its very nature."

The concept of modular or block training has far-reaching implications. "The more flexible secondary school curriculum now in vogue lends itself to the designation of blocks as early as secondary school level so that post-secondary institutions can build on a firm base in full-time courses or evening courses," says the Canadian Manufacturers' Association, which strongly advocates block training.

In the United States, a "core" training system is being examined in the health science field. Students entering this "core" might go in a number of different directions working from a common knowledge base. Both universities and community colleges in Ontario are developing programs in which experience is mixed with academic learning. The University of Waterloo has led the way in the introduction of co-operative programs between students and industry.

While educators and industry are examining new methods of education and future manpower needs, students must make a careful choice of courses applicable to their goals and interests.

A brief prepared by the Career Counselling and Placement Centre of the University of Toronto to the Draft Report of the Commission on Post-Secondary Education stresses the need to provide better career information to students before they enter post-secondary education.

"Far too many people do not seek career information until such time as the only action which can be taken is of a surgical nature; that is, when many options have been cut off and only a small proportion of them remain open," says the brief.

Students thinking of university education should choose a vocation, says N. A. Macdougall, general manager of the Technical Service Council. "Engineering, medicine, law, dentistry are preferable to esoteric Ph. D. courses that lead nowhere. Students should avoid general arts courses and ecology courses, and should seek summer employment to give them a diversified view of the working world."

In the future, business may not be as enamored of the university degree as it has been in the past. Not that the degree won't be important, but there will be more emphasis on what a person can really do and less on accepting him or her simply because of a degree, diploma or certificate.

The Commission on Post-Secondary Education in Ontario was quite critical of the practice of business giving preference to degree-holders without adequate investigation. It pointed out that there is virtually no evidence that a university degree per se will fit a man or woman into the complex business of life. It is no guarantee of the qualities of character, reliability or even thought suited to the business community.

The Commission believes that Ontario should abandon completely the existing system of degrees and diplomas. Instead, students should receive a descriptive record of courses taken and their performance in these courses. This approach would open the way to more flexible education. An individual would no longer have to attend college or university for a specific three or four years. The commission recommends this approach be introduced at the graduate or professional level to determine how best it could be applied to the whole post-secondary group.

Perhaps the most encouraging fact about the super-industrial age is that people are far better educated and prepared than they were to meet the first industrial revolution. But the shock, turmoil and changes are going to be great. So far, the experts say, we are experiencing only the groundswell of change. □

CONVENTION '73

redominant among the sues discussed at the ith annual meeting Toronto of the ntario Municipal lectric Association nd the Association Municipal Electrical ilities were the commendations of sk Force Hydro.



Premier William Davis

tility elections ill stay — PM

tradition of electing utility commis-ers will remain unchanged, Premier iam Davis told delegates at the annual vention, alleviating fears over a Task ce Hydro recommendation that the missioners of regional utilities be ap-ted by the regional municipal council ter than elected.

r. Davis explained that while com-sioners will continue to be elected, a ns would be devised to allow for the intment of commissioners if this is by a municipality to be more appro-

e went on to clarify several other areas sagreement resulting from the release e first two task force reports.

dealing with the task force recom-dation calling for a rationalization of utilities into upper tier regional utili-ties, Mr. Davis pointed out that while the government is committed to the need for regional government it is aware that needs are different in various sections of the province.

"As far as the relationship of municipal utilities to upper or lower levels of government within a region is concerned, I am persuaded personally, and anticipate it will soon become government policy, that each situation should be evaluated on its merits.

"Before proceeding, the government intends to look at the needs of each region individually. I am not convinced that an immediate upper tier structure would be appropriate, at least not at this point in time, in every case.

"It is my hope that it will be possible to establish fairly soon a group representative of the OMEA, Hydro, the Ministry of Treasury, Economics and Intergovernmental Affairs which will study, and recommend to us, whether it is appropriate for municipalities to be assigned to upper or lower tiers of government," he said.

"We would go into each region with representatives of these groups and work out the most practical approach to it." The same group would probably study consolidation of other utilities outside the regional government structure.

Mr. Davis expressed a desire to see the evolution of bigger and stronger municipal utilities, stating his belief that the recommendations of the task force, rather than doing away with the concept of municipal utilities, are designed to update and strengthen that concept. The larger distribution units would correspond with the pattern of new municipal governments across the province.

The Premier also attempted to clarify the intentions of the task force recommendations in the area of ownership and control.

"It has been suggested that the proposal to turn Hydro into a crown corporation would constitute a 'takeover' of municipal electricity systems, and that the task force seeks to remove the authority of local electric commissions in distributing electric power.

"I suggest that in no way do the task force recommendations imply a 'takeover' of the municipal utilities — they would remain as they always have been, separate corporate entities collaborating with Ontario Hydro in accordance with the terms of contracts which are bilateral agreements defining the conditions under which electricity is to be supplied by Hydro. Authority for distribution in their defined area would remain with the

utilities.

"If the term 'takeover' is to be equated with responsibility for the system, then the so-called takeover has long been enshrined in legislation under the Power Commission Act, which explicitly states that responsibility for the total system rests with Hydro."

The Premier stressed that the municipal utilities have over the years worked co-operatively with Ontario Hydro and done an excellent job within the total delivery system.

Concerning the ownership of Hydro, Mr. Davis outlined two separate lines of thought. The first, supported by the OMEA, suggests that Hydro is co-operatively owned by the municipal electric utilities and that the individual customer is a shareholder.

The second, which he said Task Force Hydro feels more realistically reflects the situation, suggests that "Ontario Hydro is an agency of the provincial government, with ownership being vested in the public at large; moreover, control over it should be exercised through the legislature."

Mr. Davis pointed out that the Power Commission Act tends to substantiate the second line of thought. "The whole basis on which capital expansion has been financed through provincial government guarantees of Hydro bonds would argue that control in the broader sense does and should lie with the elected representatives in the legislature."

However, he explained, the task force recognizes that the utilities have a financial stake in Hydro and in his view, should, through the OMEA, have a voice in the affairs of the Hydro corporation.

"It is my hope that when the new legislation establishing the Hydro corporation and enlarging its board is passed, that there will be municipal utility representation on that board.

"The government has accepted the recommendation to redesignate Hydro as a crown corporation, but certainly not with the aim, as has been suggested, of turning Hydro into a vast, profit-making commercial enterprise controlled by the government.

"No way do we want that. On the contrary, we propose only that the present commission, which in view of its assets, responsibility and structure is already in fact a corporation, be so designated."

On the question of power costing and rate philosophy, Mr. Davis said it is his understanding that the task force has no intention of recommending a deviation from the 'power at cost' principle, nor is there any intention of recommending that Hydro should earn a profit or that funds be taken from the system in the form of hidden taxes.

"What is essential in any power costing," he said, "is that the cost of power realistically reflect the need to pay for ALL the costs incurred, including the need to provide for new capital facilities to meet the rising demand for power."

Mr. Davis said also that Task Force Hydro is likely to recommend some form of rate review (as opposed to regulation) process to examine power costing, wholesale and retail rates, financial and associated issues, and provide some apparatus by which appeals could be heard.

As well, the need for citizen participation and open planning by Hydro could lead to the establishment of some form of environmental review board, he said. The board would offer assistance in the planning and development of all energy-producing or transmitting projects, to ensure that power needs are fulfilled, environmental considerations taken into account, and that a realistic decision is reached.

Earlier in his speech, the Premier emphasized a fact which, he said, is often overlooked. "When a royal commission or a task force issues a report or series of reports, the recommendations advanced do not automatically become government policy.

"All I can say is that when this government appoints a royal commission or a task force, it does so with a view to obtaining information and recommendations upon which positive action can be based, rather than as a pretense at great activity and concern that may ultimately signify nothing."

Fewer utilities are 'inevitable' - Gathercole

Greater integration and consolidation of the municipal electric distribution systems appear inevitable, says Ontario Hydro Chairman George Gathercole, who called on delegates to co-operate to this end. Mr. Gathercole noted that Task Force Hydro had given considerable study to the possibility of consolidations.

"I suspect that many of you would support the practice of smaller rather than larger distribution systems. This is a problem that is inherently controversial, but the nettle must be grasped," he said.

"There is no virtue in mere numbers, and with the gradual adoption of regionalization for local government services across the province, it does not seem to make sense to contend for smaller pockets of electric power distribution unless there be convincing reasons to the contrary.

"With the modern, sophisticated and specialized equipment of today, we in Ontario Hydro have found that by widening the area of operation we can achieve economies without sacrificing quality of service," Mr. Gathercole said.

He said there have been differences of opinion over the task force reports, but the observations and recommendations must be considered as a serious and genuine effort to strengthen Hydro and enable it to more effectively meet the many problems ahead.

"Whatever the final shape of our common enterprise, we must at all costs preserve the close relationship betwee



George Gathercole

ntario Hydro and the OMEA and AMEU. has been an active, fruitful partnership nd we are a better organization because f it. I have always recognized your right o be consulted, to criticize, reproach, uide, advise and recommend. Whatever ie eventual organizational structure, this elationship is vital and must be main-ained."

Mr. Gathercole said that changing pub-c attitudes towards transmission lines, bwers, plants and other facilities have equired Hydro to adopt a more flexible pproach in its communications with unicipalities, planning boards, and the eneral public.

"We have now launched a program of pen planning with a view to increasing ublic participation. From now on, citi-ens will have a greater say before facil-es are located.

"It is hoped that greater public partici-ation will facilitate wider and quicker cceptance of facilities, but if it leads to reater controversy and more protracted elays, the results could be self-defeating terms of both higher consumer cost and convenience."

One issue which the Hydro chairman ged the utilities to consider was the uestion of advertising. He noted that more and more people are saying advertising and promotion are artificially increasing electric consumption, contributing to a rapid depletion of non-renewable energy resources and adding to the problems of pollution.

"While we can produce facts, figures and arguments ad infinitum in support of our position, many people are not listening. We have to ask ourselves whether the ill-will and the credibility gap which some of our advertising and promotion is creating in the public mind are outweighing the benefits of these practices in terms of helping to hold down unit electricity costs and rates."

He wondered whether Hydro should concentrate exclusively on its more basic marketing functions of providing information about its services and of working closely with its customers and the various segments of the electrical industry to improve customer service and satisfaction.

"We have already imposed constraints on our advertising program and are considering others. We would like your advice," he added.

Muncaster helps clear the air

There are four basic issues in the report of Task Force Hydro which appear to be of concern to the OMEA, J. Dean Muncaster, chairman of the task force steering committee, told convention delegates.

"Some of the issues," he said, "reflect differences of opinion while others result from a misunderstanding of the intent of the task force's first reports."

Mr. Muncaster said that in its first report, the task force recommended that Ontario Hydro be responsible to the provincial government for the generation, transmission and distribution of electric energy in the province.



J. Dean Muncaster

"This has been construed by some to imply a takeover of the functions and responsibilities of the municipal utilities," Mr. Muncaster said.

But, he added, this was not the intent of the recommendation at all. "What we did was to add our support to the role of Ontario Hydro as it is currently defined in legislation.

"There is no question in our minds that Ontario Hydro is and has been responsible for Hydro in Ontario. We also feel that this should continue. In this area we are not advocating a change, and to construe in any way that our position represents a departure from the past is to misunderstand our recommendation," Mr. Muncaster said.

He added that as the task force reviewed Hydro's operations, one thing became abundantly clear — the need for funds is going to increase significantly.

"This is true whether we talk in terms of internally or externally-generated funds. Ontario Hydro must undertake an extensive capital program.

"Internally-generated funds will account for only 10 per cent of the capital requirements of Hydro over the next five years. During this period, if existing financial policies continue in effect, Hydro

new preside

will experience a deterioration of the debt-equity ratio from its current level of about 79 per cent to one of about 85 per cent, which will have an adverse effect upon Hydro's credit standing and will undoubtedly increase all borrowing costs.

"The task force, therefore, feels that in order to improve and maintain the long-term financial viability of the organization, there must be an increase in internally-generated funds," Mr. Muncaster said.

Ontario Hydro has always earned a rate of return, Mr. Muncaster said. It has, however, never been clearly identified as such and other measures of financial performance have been used. "It is for this reason the task force is recommending the addition of this tool in future throughout Hydro in Ontario.

"One of the concerns expressed in relation to rate of return was the implication of a possible profit and its use. I don't think there was real concern with the question of Hydro earning a return sufficient to meet its financial needs, including reserve requirements, but rather what might happen to any surpluses.

"There was an implication that the underlying intent was to generate funds for provincial or other uses. This is completely inconsistent with our first report and will be with our financial report where we will be recommending that all funds be retained within the electrical systems.

"Our recommendation is that any surpluses be retained by Hydro to be used at the discretion of the board for debt retirement, system expansion, rate stabilization and to provide for contingencies," Mr. Muncaster said.

He added that the task force would also be recommending that the accumulated equities of the municipalities and the power district be built up not just from funds contributed for debt retirement, but also from any funds contributed for these broader purposes.

Mr. Muncaster said the third issue related to the reduction of the number of municipal electrical utilities within the province. "Regardless of whether we move in the direction of upper or lower tier utilities, the number of municipal electric utilities will decrease."

In its fourth report, the task force will be suggesting a rate review process for Ontario Hydro, Mr. Muncaster added. "We recognize the OMEA has played a vital role in the rate process in the past and we would hope that they will perform an even more valuable role in the future.

"However, the interests of the direct customers and the power district must be more accurately reflected than they are at the present time, and we are therefore suggesting a process which would include public hearings and intervention by interested parties in the rate-setting process. This was the fourth basic issue identified by the speaker.

"But public participation is much more than rate review boards and public relations techniques. It requires each of us to find ways to involve the public in its utility, its planning and its operation, regardless of our personal interests," Mr. Muncaster said.

Work gets into blood, Alexander

Ernie Alexander, of Barrie, is a tall, quiet spoken individual who believes in being active in organizations in which he's involved. It's a philosophy which has led to the 46-year-old building contractor being elected 1973-1974 president of the OMEA.

Association work is nothing new for Mr. Alexander. A casual glance at his desk diary might give the impression that community work's his vocation and the family construction business just a hobby.

When he took up the presidency of the OMEA this month, Mr. Alexander was reliving a similar event just 11 years ago in Windsor. On that occasion he was elected president of the National Housebuilders' Association — a job which demanded much of his time and organizational abilities. That year he travelled 30,000 air miles and spent a third of the year away from his own business.

The association has since changed its name to the Housing and Urban Development Association of Canada, and Mr. Alexander remains an active director.

"This kind of thing gets in your blood," he says. "It's a challenge and I like challenges."

So it was no surprise that a year ago Ernie Alexander decided to let his name stand for the vice-presidency of the OMEA.

"I had done considerable thinking about it, but I really didn't make up my mind until the last minute."

Of primary concern to the OMEA are the recommendations of Task Force Hydro. "We've had our problems interpreting the task force reports and the interpretations we came up with have worried us a great deal," Mr. Alexander says.

Rates, the question of distribution remaining with local utilities, marketing policies and representation on the new Hydro board of directors were singled out as main problem areas.

"Whatever happens, the local utilities

ts take over in decisive year



Ernest Alexander

ust retain autonomous control over their vn areas," he adds.

As for representation on the new Hydro ard, Mr. Alexander says the ultimate m of the OMEA is to have directors osen on the basis of equity (the munici- l utilities hold 70 per cent interest in dro).

"We want the best deal possible for our stomers and we've been given an assur- ce from Premier Davis that there will frank discussions and the OMEA will able to contribute meaningful input. n confident now that there will be a ooth transition on this basis.

Ernie Alexander's experience in the mmunity should stand him in good ad in the coming year.

He was only 24 when he was elected to rrie council as an alderman. In 1954, formed the Barrie Builders' Associa- n and was its charter president. Five ars later, on the prodding of fellow ilders, he ran for Barrie PUC and was cted. Since then he has served five ars as chairman and has been a direc- of District 2, OMEA for six years.

The new OMEA president was born in rrie and has been in the construction siness there for 26 years, joining the ily firm in 1947. It became a limited mpany in 1959.

Mr. Alexander's credentials also include director and secretary of Barrie Industrial Assistance Company Limited, past director of the Canadian Construction Association and past chairman of the Board of Stewards of Collier Street United Church, Barrie. He's a member of the Corinthian Lodge, the Sheba Shrine Club and the Rameses Temple.

With all these activities, he still finds time to teach half days at Georgian College. The four-month course, which ends in April, is a pre-apprenticeship training program for the construction industry and is a pilot project in the province, established because of representations from householders.

As he glanced through his scrapbook recently, Mr. Alexander noted that his election last year to the vice-presidency of the OMEA came exactly 10 years to the day that he was chosen vice-president of the National Housebuilders. He doesn't know what he'll be doing 10 years from now, but he'll probably be working for some association.

"My philosophy is that you only get out of something what you put into it," he says.

Need to bolster ties, says Seath

Douglas M. Seath takes over as president of the AMEU in what may be the most crucial period in the association's history.

Both the AMEU and OMEA face a great deal of change in the years ahead, but in the mind of the tall, 51-year-old, soft-spoken manager of Stratford Public Utility Commission, the continuation of the "Hydro family" is an overriding concern. In fact, he intends to steer the AMEU on a course of even closer family ties with the OMEA and Ontario Hydro during his year in office.

A 1949 graduate in electrical engineering from the University of Toronto, Mr. Seath entered university after nearly five years overseas with the Royal Canadian Air Force where he rose from the rank of



Douglas M. Seath

aircraftsman second class to squadron leader.

While in the Air Force, Mr. Seath found time to earn a Higher National Certificate in mechanical engineering from the U.K. Institute of Mechanical Engineers.

It was attending an OMEA-AMEU convention soon after graduation that prompted Mr. Seath to enter the municipal utility field. It's a decision he's never regretted, "regardless of the frustrations we sometimes encounter."

Doug Seath was relaxed but serious as he sat with his hands clasped atop his dark mahogany desk and chatted about the utility business.

He acknowledged that as a result of Task Force Hydro recommendations there will be numerous changes within the municipal utility set-up in the near future. But he says "no matter what happens . . . amalgamations, consolidations, fewer but larger utilities, we'll still be responsible for providing service for the same number or even more customers."

Mr. Seath sees the role of both the OMEA and AMEU becoming more important "in the new scheme of things."

"The AMEU has been working in concert with the OMEA and Ontario Hydro since its inception and if I have any particular goal to achieve while in office, it

is to ensure that this co-operation continues," he says.

"We're all part of a family and I intend to ensure the AMEU fulfills its role in that family," Mr. Seath says.

He adds: "There are people who think the AMEU and the OMEA are different, but really we're not. The two organizations combined represent the municipal utility operation in this province. The two organizations really are one.

"Elected commissioners are members of the OMEA and as such can be compared to the board of directors of a business concern. Administrative staff of the utilities are members of the AMEU and provide administrative and technical recommendations which can be considered by the OMEA in establishing policy for Hydro in Ontario."

Gazing over the AMEU organization chart, then casting a quick glance toward his bookshelf which is lined with AMEU guides for everything from engineering to office practices, Mr. Seath comments that "some people think we're some sort of a fraternal organization.

"But that's not so. We're a very significant organization. These guides represent a wealth of knowledge gleaned from people who represent all the municipal utilities in this province. We've found the compilation of these guides to be the best and most practical way to operate our business."

Mr. Seath says there has been an extremely effective liaison between the OMEA, AMEU and Ontario Hydro in the past. "Sure, there will be changes. But no matter what they are we're still going to have Ontario Hydro, the OMEA and the AMEU. The municipal utilities are still going to be recognized — more so than ever before."

Of the recommendations of Task Force Hydro, Mr. Seath said: "Certainly, our operation can stand scrutiny. It's being done for the ultimate benefit of the customer.

"Task Force Hydro isn't a royal commission to investigate our operation. It's exactly what the name implies, a task force set up by the government to take a look at the Hydro operation. We're living in a time of change and we must be prepared to react to change. A good strong organization, such as the Hydro family, can react positively to any changes that may be brought about."

Mr. Seath began his career as manager at Stratford in 1958, going there from Ingersoll PUC where he had been manager for eight years. Prior to that he was in the engineering department at St. Catharines PUC.

With a population of 24,000 — it increases substantially during the theatre season — Stratford has a 41,000-kilowatt peak demand, but Mr. Seath hastens to add that the load isn't influenced a great deal by the theatre. He says Stratford has a diversity of small and medium-sized industries.

Not only does the utility provide electrical service, but water and transportation, too. Its bus system is unique. During the day it operates on regular routes, but after 6 p.m. a dial-a-ride transit system (DART) is instituted. Under the system, passengers may call a central number, be picked up at home in any of the city's four zones and be transported to the core area. Although DART has been operating less than a year, buses are carrying an average of 200 passengers an evening.

Crown corporation idea opposed

The OMEA has proclaimed its continued opposition to the designation of Ontario Hydro as a crown corporation. If implemented, however, members want majority representation on the proposed 11-man board of directors.

In the convention's final resolutions session, delegates closed ranks to pass three resolutions dealing with Task Force Hydro's role and place recommendations.

In addition to opposition to a crown corporation, delegates urged elected rather than appointed municipal utility commissioners.

And they asked the government to have Task Force Hydro issue "a supplementary paper clarifying those recommendations which are at present not readily understandable by the general public."

W. S. (Sam) Jennings, of Niagara-on-the-Lake, criticized a task force statement that ownership and control of Ontario Hydro resided in the Ontario government. He read a passage from a 1921 brochure issued in connection with the opening of the first Beck generating station at Niagara Falls which stated that Ontario Hydro was "trustee for the municipalities."

In opposing creation of a crown corporation, delegates accepted an amendment from Andrew Frame, of Burlington, a member of the Task Force Hydro steering committee.

Mr. Frame said there was "no way" the government was going to hand over to the OMEA the right to appoint Ontario Hydro commissioners. "I think we have to face reality," he said.

Mr. Frame said his intention was to make the resolution acceptable to both the provincial government and the OMEA. He suggested that the OMEA prepare a short list of approximately 12 elected nominees from which the government could choose six of the proposed 11-member body.

On the issue of elected commissioners, J. L. Christie, of East York, said the resolution should "nail down" this OMEA demand.

J. A. McLean, of Woodbridge, and George Burley, of Niagara Falls, expressed fear that, instead of elected utility commissioners, Premier Davis meant that regional utilities would be run by committees formed from elected members of councils.

Delegates approved an amendment inserting a clause that "we are pleased to receive the Premier's assurances," but they also declared that "control of the utility should be entrusted to elected commissioners" and not to appointed commissioners.

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Recycling plutonium

A new advanced type of nuclear reactor that will use natural uranium slightly enriched with recycled plutonium is being designed by Atomic Energy of Canada Limited.

The new design, similar to the 250,000-kilowatt Gentilly prototype in Quebec, will use heavy water as a moderator and boiling light water for heat transport.

The new reactor will be approximately the same size as the Gentilly unit, but will produce about 600,000 kilowatts.

AECL estimates that Canadian reactors will produce spent fuel containing 7,600 kilograms of useable plutonium by 1980. At present, the spent fuel is kept in storage bays at nuclear stations although AECL has sold a small quantity from the Douglas Point plant to France for reprocessing.

By recovering this plutonium and using it to enrich natural uranium, Canada would be able to almost double the amount of energy that it could extract from every pound of natural uranium. The plutonium would, in effect, stretch out Canada's uranium reserves by a similar amount.

The new reactor would be a modest form of breeder reactor. AECL studies indicate it will produce as much new plutonium as needed to continue enriching more natural uranium fuel once the enrichment process is started.

The enriched fuel design promises to reduce capital costs and lower requirements for heavy water. However, the need to process the spent fuel to extract plutonium will mean higher fuel costs.

AECL is also investigating Pickering-type reactors using recycled plutonium that are both cooled and moderated by heavy water; Gentilly-type reactors enriched with uranium-235, the more fissionable form of uranium; and plutonium-enriched reactors using an oil-like organic coolant.

AECL experts predict that the plutonium-enriched reactor could be built commercially in Canada as early as the end of this decade.

Phase three

Ontario Hydro and several U.S. utilities are embarking upon the third phase of a research and development program aimed at reducing air pollution from generating stations which burn fossil fuels.

Hydro and its U.S. counterparts are co-operating in the development of the Babcock and Wilcox-Esso system to minimize emissions of sulphur oxides and nitrogen oxides from power plants.

A final decision on construction of a demonstration unit at a U.S. power station will be made in the near future. If a decision is made to go ahead, construction could be completed late in 1974. Successful operation of the demonstration unit would mean the system should be available for purchase by 1975 or 1976.

The research and development program, begun in 1968, is financed partly by the utilities taking part.

AMEU get-together

AMEU Manager Ron Mathieson's friends, family and staff attended a surprise reception recently for the man who has guided the affairs of the Association of Municipal Electrical Utilities for the past quarter-century.

Tribute was paid to Mr. Mathieson by N. A. Grandfield, Brantford PUC's manager and a past president of the AMEU, and some of his "cronies" including R. S. "Smokey" Reynolds, of Chatham; H. A. "Tooner" Howard, of Thorold, and E. A. Washburn, of Burlington. Presentations included Pierre Berton's two latest books and a movie camera outfit.



Chain of office

Twenty-one AMEU past presidents were in attendance along with the board of directors, OMEA President Archie McGugan and OMEA Secretary-Manager E. C. Nokes. From Ontario Hydro were Chairman George Gathercole, General Manager D. J. Gordon, Assistant General Manager – Regions and

Marketing, D. B. Ireland and Director of Consumer Service E. G. Bainbridge. Also in attendance were former chairman W. R. Strike, former vice-chairman D. P. Cliff and former general manager Dr. J. M. Hambley, all longtime associates of Mr. Mathieson.

Vacations on increase

Increased vacations and other fringe benefits were the highlights of wage contracts negotiated by Ontario utilities last year, says Alex Grant, a labor relations specialist with Ontario Hydro.

In an address to district 4 OMEA, Mr. Grant described as "peculiar" the fact that of 36 contracts signed, 33 provided for more time off.

"That's a large percentage of utilities who believe they were not giving sufficient vacation benefits or it's a large number of unions who sought and gained increased vacation packages," he said.

Mr. Grant said that his department, which assists utilities in their labor relations, was in the process of conducting a survey to determine costs of fringe benefits in the utilities. He noted that several utilities are paying more than 50 per cent over and above a lineman's basic wage in fringe benefits. In other words, a lineman making a basic $8,000 a year is getting an extra $4,000 in benefits, Mr. Grant said. His example included $900 for vacations, $400 for statutory holidays, $450 in sick leave, $700 in rest periods, $670 in pension plan.

"These so called fringe benefits are no longer fringe benefits," Mr. Grant said. He noted that one utility was paying a lineman $5.35 per hour, but with the non-productive benefits the cost jumped to $8.06. Out of a possible 2,080 working hours only 1,518 were spent on the job, the remainder consisting of time off for vacations, paid holidays, rest periods and the like.



District 4 OMEA officers for the coming year are: seated, John Dunn, North York, first vice-president; M. W. Broley, Scarborough, president; Don Hamilton, Aurora, second vice-president. Standing: M. J. Damp, Toronto, secretary; Ontario Hydro Chairman George Gathercole, honorary president; Lorne Andrews, Uxbridge; Bill Rowney, Milton; Jack Christie, East York, past president; Tony Green, Oakville; Ron Walker, Streetsville, and Richard Horkins, Toronto.

Frank talks on TFH

The annual meetings of OMEA districts 4 and 5 could best be described as a dress rehearsal for the provincial convention in Toronto. Emphasis at the meetings was on Task Force Hydro and the concerns municipal utility commissioners have with its findings.



The men who will preside over the activities of OMEA District 5 this year are seen at the Gullivers Travels Motor Hotel in Stoney Creek. They are directors George Burley of Niagara Falls; Bob Howarth, Niagara; Sid Baldwin, Ancaster; E. B. McPherson, Port Colborne; D. P. Cliff, Dundas, honorary president; Frank Kaupp, St. Catherines; George Butcher, Simcoe, past president; Keith Duncan, Lynden, secretary, and Gordon Robertson, Lynden, president.

Hydro Chairman George Gathercole recognized the feelings and expressed the hope that frank discussions would resolve anxieties by municipal officials. And Richard M. Dillon, executive director of the task force, reiterated his position that the study "sought to preserve the fundamental relationship between Hydro and the utilities."

Mr. Dillon said: "We have seen a need to assess the whole system and we hope what is sound will be retained."

Mr. Gathercole said he is convinced the relationship of free and frank discussion between Hydro and the municipal utilities and their associations must continue under whatever modifications are developed for Hydro in Ontario.

"I have long learned that it is a mistake to be pessimistic," he said. "Hydro is a tough and resilient enterprise. It has a good reputation and today is in a better position than most utilities to meet the needs of the people."

But Mr. Gathercole conceded that the Ontario utility system is not perfect, and that changes can be made. "We should be prepared to try new methods. We can become too self-satisfied and set in our ways. To experiment can give zest to our task."

The chairman stressed that he does not favor change for the sake of change. "That is a useless pursuit. I am confident that if we can achieve an atmosphere of frank discussion and reasonableness, the process of innovation can help us to fulfill our responsibility which, as I understand it, essentially is to provide the best possible service to our customers at the lowest reasonable cost, consistent with the security of supply and general sound and economic well-being of the people of this province.

"We are confronted with formidable challenges at a time of rapid change and in an atmosphere in which people are much less content to accept past practices and procedures no matter how successful they may have been."

Jack Christie, of East York, outgoing president of district 4, told delegates: "You have the very serious responsibility of making sure that the people who elected you know about the report, have an opportunity to form opinions and know the route by which they should make their opinion known to the Ontario legislature – where the members will be making the most important Hydro decisions since the days of Sir Adam Beck."

Mr. Christie felt that the OMEA in the past has lacked the authority to make it a strong and effective force. He suggested that additional research staff in the association office and the relocating of AMEU offices nearby would help to strengthen the association. "Such a move would ensure that the two organizations would work even closer than before."

Life saver

A 21-year-old Scarborough PUC apprentice lineman, Brian Evans, has been given two safety awards and a gold watch for saving the life of a fellow lineman last August.



Quick thinker

The hydraulic boom of a bucket truck came in contact with a live 8,000-volt line while underground cables were being installed in Agincourt.

Lineman Howard Serson, 42, was knocked to the ground unconscious and badly burned in the mishap. Mr. Evans immediately applied mouth-to-mouth resuscitation to revive the victim.

Mr. Evans has been given the International Brotherhood of Electrical Workers' safety award and the Electrical Utilities Safety Association's certificate for meritorious action. He is seen, second from right, receiving an engraved gold wristwatch from PUC chairman Dick Cavanagh. Looking on are commissioner Steve Broley and Mr. Serson.

Familiar faces missing

Some familiar faces will be missing from the utility scene in the coming year, either through defeat at the polls or by opting for retirement from public life.

Among the notables is Sarnia Hydro's John T. Barnes, who has decided to step down, bringing to a close a public service career which has spanned nearly 40 years.

Mr. Barnes first entered politics in 1935 and served five years as an alderman, then three years as Sarnia's mayor before being elected a Hydro commissioner in 1943. He has sat on the commission ever since, serving several terms as its chairman.



Long service . . . and a certificate to prove it

Mr. Barnes served as president of OMEA District 8 for three years and has been an active member of several provincial executive committees. He is

seen receiving a long-service certificate on behalf of the OMEA from the association's secretary-manager Ed Nokes.

Retiring with Mr. Barnes is his long-time commission colleague G. C. Allen, last year's Sarnia Hydro chairman.

Another familiar face which will be missing is that of F. R. Cross, of Nepean, incumbent president of District 1. Mr. Cross, one of the founders of Nepean Hydro, was unsuccessful in his bid for re-election.

And D. A. (Don) Watt, of Orangeville, a veteran commissioner and former president of District 2, has decided to step down. So has W. R. Tomlinson, of Port Elgin, Mr. Watt's successor to the presidency of District 2 and a Hydro commissioner for the past quarter century. When Mr. Tomlinson announced his decision to retire so did Hugh MacKenzie, who sat with him on the commission for 18 years.

There are many others, too, including East York's Mayor True Davidson and Charles Ellerbeck, who decided against seeking another term on the commission after having served 24 years.

Howard Walker, of Port Hope, decided against seeking another term after having served 26 years in office, many of them as chairman of the utility, as did Barrie's mayor L. E. Cook, a strong supporter of District 2.

E. J. Hawthorne, Dryden Hydro's chairman and first vice-president of District 3, went down to defeat at the polls along with W. W. (Waino) Laakso, in Thunder Bay. Mr. Laakso was second vice-president of District 3. Mayor Saul Laskin didn't seek re-election.

P. J. Blundy and H. B. Lofquist, of Oakville PUC, are missing from this year's OMEA roster as well as George Laing and R. T. Gilbert, of St. Thomas, and G. D. Sills, of Seaforth, and Charles Howdon, of Leamington.

Other familiar OMEA people no longer connected with the association are Etobicoke's retiring mayor Ed. Horton and J. P. MacBeth, a former District 4 president who has been elected an MPP.

Power group post

Ontario Hydro's chief engineer, Harold A. Smith, has been elected a vice-chairman of the Northeast Power Co-ordinating Council.

NPCC's 21 utility members represent more than 98 per cent of the electric generating capacity in the northeastern part of the United States and Canada.

Member systems have a total capacity of more than 52 million kilowatts and serve more than 36 million customers. Ontario Hydro, with a capacity of about 15 million kilowatts, represents the largest single segment within the council.

NPCC was formed to promote maximum reliability and efficiency of electric service in the interconnected systems by extending the co-ordination of system planning and operating procedures.

municipal briefs

A residential sales supervisor in Ontario Hydro's western region, Art Murphy, has been credited with saving the lives of two London residents. He was leaving the home of a friend when he noticed flames in the house next door. Driven back by dense smoke at the front door, he entered the rear door and rescued the two occupants from the kitchen.

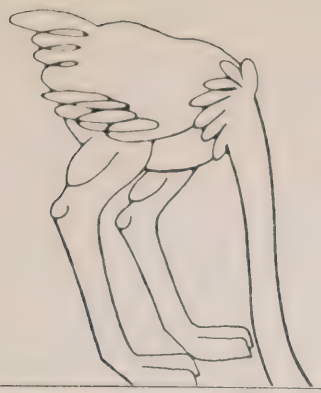
A former chairman of St. Catharines PUC, R. Douglas Hunter, has died at age 74. Mr. Hunter was a member of the St. Catharines commission for 25 years.

Goderich PUC has bidden farewell to two long-term employees. At a dinner, the staff and commission paid tribute to Miss Helen McCarthy who retired as office manager and Harry Crane who was Hydro foreman.

Tottenham PUC has received a framed citation from a nation-wide group of steam railway buffs called "The Steam Savers". During a campaign to keep Canada's last operating steam engine rolling, the utility promised to fill the CNR locomotive with water free of charge, whenever it passed through the village.

Alexandria PUC's outside workers have been unionized. The International Union of United Brewery, Flour, Cereal, Soft Drink and Distillery Workers of America has received certification to represent them.

A World Bank employee, Raymond Ewasiuk, 42, has accepted a position as financial manager at Sudbury Hydro. Prior to his appointment to the World Bank staff, Mr. Ewasiuk was secretary-treasurer of Mississauga Hydro.



as don wright sees it

Scientists have long been asserting that the physiological characteristics of the human race are changing through the process of evolution. As our need for knowledge expands, we will require a bigger brain and a roomier cranium in which to tote it around. Electronic technology will bring the world to our doors so that our legs will shrivel up as our mobility declines. Teeth will become obsolete as we turn more and more to convenience foods. And who knows what proportion our other organs will assume as we find better ways of doing just about everything?

All in all, it's not a very reassuring picture, but the chances are we'll be able to amble around on our own two legs, while retaining a tooth or two, for another five or six million years. More imminent by far and even more frightening is a genetic change which may be manifesting itself upon the present generation. We refer to the loss of our collective funny bone.

The thought came to us while attending one of those tea and bickey parties where an office stalwart was receiving kind words and a pair of solid steel cufflinks for his first 100 years of good and faithful service. What struck this old codger most forcibly about the change he had witnessed in a century or so of honest toil was a diminishing ability to combine fun with hard work. He couldn't understand why the two seemed to be growing more and more incompatible.

Neither can we, but this is no time to start letting the absence of fact stand in the way of our rhetoric. We like to think that this column has always been based on a solid foundation of conjecture, hyperbole and crass speculation. As far as our funny bones are concerned, they are probably losing most of their sensitivity in striving to survive under the heavy blanket of gloom being spread by the prophets of doom.

Consider the outlook. If the population explosion continues, people will soon crowd out every other living creature and we'll have to take turns standing on each other's shoulders for a glimpse of the sun. Fortunately, this isn't likely to happen for the simple reason that we'll choke to death on our own garbage long before this sorry state of affairs can arise.

Thankfully, death by garbage is only a remote possibility as our energy and other resources are expected to run out sometime after 1980 at which time industry will shut down and we'll be done in by a combination of cold and starvation. The more optimistic prophets see a quicker and more merciful end coming through the medium of our nuclear plants, which may be expected to explode like popcorn sooner or later and for one good reason or another.

It's no wonder, then, that our funny bones are becoming calcified and we'll have to fight back hard against the sad sack syndrome. Humour is essentially a sense of proportion and even such sancrosanct and sepulchral subjects as pollution, energy depletion and task forces cannot be entirely devoid of funnies.

In fighting pollution, for example, we can in all probability pluck the cinders out of our air just as effectively with a chuckle as with a groan. The length of our miens need not necessarily match the gravity of the situation.

In suggesting that we avoid taking ourselves too seriously, we are in no way pleading in defence of this column. Literary and philosophical gems such as those found here need no defence. They are absolutely indefensible.

■ Attuned as we must always be to every new social trend, we began to suspect recently that the growing use of the suffix Ms. before a person's name was something more than a typographical error. On the alert, we brought this phenomenon to the attention of the Hydro News editor who was, as usual, completely in command of the situation.

Seems Ms. is a device hit upon by some other ingenious editor driven to desperation by the new fashions. What with the boys sporting long hair, peek-a-boo blouses, high heels and shoulder bags it's often impossible to identify the sex of people in pictures. When in doubt, tag 'em with an Ms. It's kind of in between a Mr. and a Mrs. so that this way an editor can only be half wrong.

■ This doesn't exactly square with a letter written by a lady to the Globe and Mail, but we think our version makes more sense. We gather from this letter to the editor that the Ms. suffix is intended to cloak the female in the same degree of marital inscrutability as the male enjoys under the title Mister. Not that she goes along with it.

In preference to the Ms. aberration, which she says sounds at best like a mild obscenity upon pronunciation, she suggests women revert to the word mistress in referring to all members of the female sex. She points out that Mrs. and Miss are comparative newcomers to the language and were never used by Shakespeare because they hadn't been invented. The far more lovely Mistress is still used in Scotland and the West Indies, she tells us.

Sounds reasonable, but the lady is living dangerously in putting forth such a suggestion at this point in time. Mistress is the feminine of master and there are any number of maidens and otherwise who would rather burn their bosom boosters than perpetuate the master-mistress connotation.

■ Readers may have noticed some reluctance on our part to comment on women's lib, but it hasn't been for any lack of knowledge on the subject. It's just that we're chicken. Even the government is running scared as witness some of the measures being enacted to ensure against employment discrimination on the grounds of sex.

Just how nervous we're getting is borne out by this help wanted ad run recently in an Eastern Ontario newspaper.

Journeyman
Woman
Lineman woman
Experienced in barehand
and hot stick work.

Linemen in the area can relax — no ladies applied. Or are they disappointed? Mini skirts and hydro poles may not be all that incompatible. Things may, in fact, be looking up—particularly the groundsmen.

Canada Post Postage Paid
Postes Canada Port payé
Bulk third class P.394
En nombre troisième classe Toronto

If you have recently moved, please write your new address within this space,
cut along the dotted line and mail in an envelope to
Hydro News, 620 University Avenue, Toronto. M5G 1X6

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Are environmental groups more in step? See page 2

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features

2 Protest puts on a new hat
Canada's major protest groups are taking on a new sense of responsibility toward environmental problems.

6 Radiation protection — a way of life
Hydro's nuclear plants contain many safeguards to protect the people working in them. But the emphasis in training nuclear personnel is on personal responsibility.

11 AECL shelves organic reactor
First priority will continue to be given to the natural uranium-fuelled, heavy water cooled and moderated units of the type installed at Pickering GS.

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Les Dobson, Editor
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The cover
Footprint is Pollution Probe's latest way of saying let's stamp out pollution. Hydro agrees and is doubly committed not only to cleaning up the environment but to planning through participatory democratic processes. Articles on some of the leading environmental groups and on citizen participation appear in this issue.

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hydro news, volume 60, number 3

Published by Ontario Hydro, 620 University Ave., Toronto.

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Printed in Canada

VIEWPOINT

Planning with public participation

During the late 1960's, society began to signal that it wanted involvement when major decisions were being made on its behalf. The message was clear. The public wanted to be consulted when governments or large corporations were formulating plans that impacted on its lifestyle. People were indicating that protection of the environment would have to receive more attention as the growth needs of the province were being satisfied.

Ontario Hydro received a clear signal when the Beverley Street transformer station in downtown Toronto became bogged down in controversy. This was followed by the postponement of the construction of the vital transmission line link between Nanticoke and Pickering. These projects were in the mill when the public's demand for involvement in the planning process began to manifest itself.

In both cases Hydro had spent considerable time assessing the traditional factors. Working with planning authorities, it had obtained some measure of agreement, but the voice of the individual property owner or tenant had not been heard until planning and property acquisition were fairly well advanced.

Rising concern, forcefully demonstrated on the part of local residents, was a development not previously encountered by Hydro. As this new public emerged, criteria had to be reassessed and new communications techniques developed by the Commission.

Hydro's response to the new society quickly accelerated and the direction it proposes to follow in planning with public assistance has now been set out in a summation statement it made to the Solandt Commission.

This involves disclosure of any proposed major project at an early stage after the need has been established. Every opportunity is provided for interested groups and individuals to present their views – including discussions at open meetings.

In the case of transmission lines, the plan is to involve the public in the selection of several broad corridors after a careful study of the many factors involved. Planners zero in on the most desirable route and specific line location only after further input from the public when all aspects of the project have been carefully considered.

The process is now in full swing with Hydro representatives and consultants holding meeting after meeting in several parts of the province. Consultants representing several disciplines are examining the many complex social and environmental factors involved when Hydro decides to proceed with a major project.

It's a good start but there is a long way to go. In a recent interview, Chairman George Gathercole made it clear that the program of public participation in the planning process will receive continuing support and a top priority. It is nevertheless of vital importance that the process be one in which there is broad representation and can lead to decisions.

"While it may not be a panacea for our environmental ills, it is hoped that greater public participation will facilitate wider and quicker acceptance of facilities. There will have to be trade-offs if Ontario's fiscal goals are to be achieved and until technology reaches a more advanced stage both the public and Hydro might have to live with some inconveniences, although it is the Commission's intention to keep these to a minimum," said Mr. Gathercole.

"The alternative would be self-defeating. Protracted delays mean higher consumer cost and possible power shortages.

"The objective, as I see it," says Mr. Gathercole, "is to establish an effective exchange of information and viewpoints with regard to each individual situation. It's a mutual education process during which the utility merges its plan with the wishes of the public. It's a process that requires a high standard of quality; a superficial or simplistic approach could be disastrous."

Speaking at the recent annual meeting of the OMEA-AMEU, Premier William Davis indicated government acceptance of the open planning process in general. He suggested that some form of environmental review board would be established to offer assistance in the planning and development of all energy-producing and transmitting projects. Its aim will be "to ensure that the power needs of the province are fulfilled while environmental considerations are taken into account."

In practice, it seems likely that the agency responsible for each energy project will be expected to make its decisions based on input from the public. The decisions will then go before the review board. And the measure of their validity will be the extent to which the board feels further public involvement is necessary.

As Mr. Gathercole puts it: "Our task is to get the best possible input from the public so that the best possible plan can be developed for submission to the review board which the government has indicated it will establish." □

PROTEST



puts on a new hat

As ecological concerns are recognized and absorbed by the establishment, a subtle change is taking place among the leading environmental groups.

Undoubtedly, the sixties will be remembered as having fostered a movement which vividly captured the public imagination, swept several continents and set great corporations and governments on a new course of action.

The idea which so suddenly took off was environmentalism – the concept reinforced by the triumphs of the space age that planet earth is an exceedingly small and overcrowded oasis tumbling through a bleak and alien void. We live in a closed-cycle system with limited resources and limited capability to absorb wastes.

Predictions of doom began to fill the news columns. Continue polluting the atmosphere and oceans and most living organisms – man included – will be extinct within half a century, said the more alarmist.

As public pressure increased, governments responded by creating special ministries and departments charged with responsibility for the environment. Industry, faced with adverse publicity and strong legislation, took steps to curtail stack emissions and improve waste disposal.

No industrialized nation appeared immune. Worst-hit was the United States where the ethic of free and unbridled enterprise came in for a severe drubbing from environmental critics. The examples are manifold. Zinc production in the U.S. has been seriously hit by the phasing out of outmoded smelters which cannot meet clean-air requirements. Three environmental groups were successful in 1971 in blocking oil leases in the waters off Louisiana. Delays in the U.S. nuclear program must be attributed, at least in part, to the activity of environmentalists.

The movement spread to most industrialized nations . . . Britain, Western Europe, Japan. In his book "Sibir," Farley Mowatt comments on how public pressure persuaded the Soviet authorities to close two cellulose and wood-chemical plants polluting Lake Baikal, which contains about one-fifth of the world's fresh water.

Recently, though, a subtle change appears to have taken place among the leading environmental groups. As ecological concerns have been recognized and absorbed by the establishment, the former crusading environmentalist has assumed a new aura of respectability. Too respectable for some, it would seem, and in the U.S. the giant Sierra Club reportedly is losing members to smaller more radical groups.

Long in the vanguard of the U.S. environmental movement, the 80-year-old Sierra Club has come in for criticism for both its size and conservative attitudes. Yet evidence of maturity on the part of its members may be gleaned from a statement by the chairman of the club's energy policy committee at a two-day meeting in Vermont.

Quoted on the subject of nuclear power by the New York Times, the Sierra Club official said: "We've been considered irresponsible for too long. We're now at the point where we don't want to be in the position of arbitrarily blocking every new electric power plant that comes along."

Philip Lind, chairman of the Sierra Club of Ontario, a 300-member affiliate of the U.S. club, says his organization is "satisfied with Canada's nuclear power program." Mr. Lind says the club's main project is to organize opposition to Hydro-Quebec's multi-billion dollar plan to harness rivers draining into James Bay.

The philosophy of the Sierra Club of Ontario is not to oppose energy development, says Mr. Lind, but to impose environmental standards. "Fundamentally, we are opposed to anyone who wants to begin any large development before information and data are fully available to determine what effect the development will have on the environment.

"Most of all," he adds, "we want to see environmental impact statements produced prior to any large construction project. This is now law in the United States, and it's coming in Canada."

The Sierra Club was prominent among conservation groups opposing the 500-kv Pickering to Nanticoke transmission line at the Solandt Commission hearings last year.

Another affiliate of the Sierra Club operates in B.C. Both Canadian clubs work independently in terms of issues and program followed, although they receive expertise and a limited amount of financial support from the U.S. club. Ontario members receive a monthly magazine published in California and a provincial newsletter. Apart from meetings and conferences, the club sponsors a number of outdoor programs including hiking, skiing, trail-siting, canoeing and conservation work.

Tony Barrett, a founder member and financial officer of Pollution Probe, also senses a new maturity in environmental attitudes. "We have a more solution-oriented society today than in 1969," he says.

Despite its short history, Probe is perhaps the best known of Canadian environmental organizations. Formed in 1969 by faculty and students at the University of Toronto, the group received tremendous impetus from the CBC-TV documentary "The Air of Death," which focussed attention on the dangers of uncontrolled air pollution in North America.

Probe still maintains its offices at U of T and functions under an advisory board headed by Dr. Donald A. Chant, chairman of the university's zoology department. Dr. Chant has had a distinguished career as a natural scientist and has been active in environmental research for many years.

Recognition of Probe's role was implicit in the Ontario government's invitation to have a representative on the Advisory Committee on Energy, which published its recommendations earlier this year. However, Probe lived up to its reputation for non-compromise.

In an appendix to the report, Henry Regier, Probe's representative, dissociates his organization with any statements which assume a continued high growth rate in energy consumption. "We are much concerned about conventional growth," Mr. Regier's letter to ACE chairman Dr. John Deutsch says in part. "The rather automatic assumptions of high growth rates – of the population, economy and eventually of energy usage–made by the committee's analysts may, we fear, serve to stimulate

FON's Gerald McKeating
"Confrontation not the most effective way."



far more social and capital investment into energy development than will be necessary.

"We had understood that a broad study on the consequences of continued growth would be recommended by the committee, but this recommendation does not appear," the statement adds.

Probe's image of toughness is reinforced by its belief that the public has a right to know everything. Mr. Barrett says the group will try to obtain and disclose the contents of confidential reports if it feels this is in the public interest. Activities are run by a number of co-ordinators, each responsible for different areas of concern. The general policy of each program is discussed with a group of advisers, but co-ordinators have the freedom to develop their own programs within the policy framework set by the group.

In Ontario, Pollution Probe has about 2,000 members, but counting affiliated organizations across Canada, the total membership adds up to more than 20,000. The group is financed by membership fees and by soliciting funds from business organizations and the public. Operating costs over the past 18 months amounted to about $250,000.

Citizen involvement is a key issue with Probe. "Future decision-making must involve the public," says Mr. Barrett. "Government cannot be solely responsible for environmental decisions – the public must participate."

Ontario Hydro is incorporating similar thinking into the planning of extra-high-voltage transmission lines. Greater public involvement in the routing of rights-of-way is being actively sought, and both individuals and organizations are being consulted at various stages in the planning process.

A recent innovation has been the setting up of a special surveys group to assess qualitatively the public response at various stages in transmission line planning and construction. Information obtained will be fed back into the organization and plans modified as a result.

Another Canadian environmental organization concerned with its image is the Ontario Federation of Naturalists. The oldest group of its kind in this country, the federation was formed in 1931 to represent naturalists concerned with the protection of plants and birdlife.

Its executive director, Gerald B. McKeating, joined the organization in 1966. "Right now, we are trying to establish a high standing of credibility between ourselves and decision-makers and other agencies to which we can contribute input and hope that we can head off problems," he says.

Mr. McKeating believes the federation can make its greatest contribution by publicizing its views rather than in head-on confrontation. "We're not in the least afraid to enter into confrontation, but in the long run it is not the most effective way," he says.

While in the early sixties the FON was concerned with the protection of wolves and problems relating to the provincia parks, its activities today cover both rura and urban environments. "We are attempt ing to get more involved with the urba way of life," says Mr. McKeating, wh admits to being a city person. "We are a interested in the Toronto Island Park a we are in Quetico. We did not oppose th Spadina Expressway because of the de struction it would cause to the ravine, bu on the broader issue of the destruction i would cause to many parts of the city."

Working with an annual budget of abou $250,000, the federation relies a great dea on lobbying various agency and govern ment officials to promote its point of view It produces a number of briefs each yea and employs the services of consultant from within the organization. Like Pollutio Probe, the issue of uncontrolled growth i a major platform.

The FON is financed by membershi

ierra Club's Philip Lind
elow: Prober Tony Barrett





fees, donations and other activities including a nature gift shop and book shop. It receives an annual grant of $3,000 from the Ministry of Education toward the publication of Young Naturalist, which is distributed to 23,000 students. The federation also publishes Ontario Naturalist on a quarterly basis. Adult membership in the organization is 13,000, not including affiliates.

In a way, Canadians are fortunate in that trends are apparent south of the border long before they become established here. Undoubtedly, some ecological groups have benefited from the mistakes of their U.S. counterparts. Government, too, can learn much from observing the results of legislative action in various states, some of which has been restrictive to the point of impracticality.

In any event, as environmental considerations become the goal of the body politic, the ecological groups are basking in a new found respectability and have tailored their actions to suit. Most of the alarmist statements of the type being uttered two or three years ago have disappeared. The emphasis now is more on controlling growth; conserving resources.

But there is another reason for the changing attitude, and that is fear of an ecological backlash. Serious curtailment of electricity supplies could, conceivably, lead to unemployment. Delays in oil and gas exploration programs, or in the construction of pipelines, will aggravate a situation which is already bordering on the disastrous.

Experts have been predicting a North American energy crisis for some time, but only last winter did the reality of the situation make itself felt. People living in the U.S. midwest and parts of New England experienced at first hand a shortage of fuel oil which closed down industries, shut schools and left householders shivering.

If the blame for such crises – and there will probably be more of them – falls on the environmentalists, the environmental cause might suffer a severe setback. No one with any sense of moral responsibility would want to see that. □

radiation protection

"ALL RADIATION DOSES MUST BE MINIMIZED — dose limits (unlike maximum speed limits) should not be treated as targets."
— Ontario Hydro Radiation Safety Booklet

by Bob Morrow

A working day in the life of Don Tremain starts in a routine way. He drives up to the gate at Pickering generating station, waves to the security guard and parks his car.

He crosses the parking lot and, like an increasing number of Ontario Hydro workers, prepares to start his day's work in the radioactive zone of a nuclear power station.

The words "radioactive" and "nuclear power" may appear slightly ominous to an outsider, but to Don Tremain it's all part of the job. To him, radiation is just a routine occupational hazard.

As he opens the station door, he is on the threshold of a radioactive environment.

First, he must cross the enclosed walkway that separates the administration building from the service wing. In doing so he passes along the only route between the clean confines of the administration building and the reactor buildings and service wing, where radioactive contamination may be found.

A yellow-and-black sign says "You are now entering Zone 2." It's the first of many signs he will encounter during the day.

(Zoning of the station is one of the many safety measures. Certain areas are off limits unless a person is qualified through radiation protection training and has duties there. An unqualified person requires a trained escort.)

Here in the service wing is the entrance to and exit from the "operating island" which is equipped with a bank of monitors to help prevent the spread of radioactive contamination. A red indicator tilts up and a buzzer sounds if a person's hands or feet are contaminated. A green tilt indicates you're OK.

To further ensure radioactive material will not be tracked into the clean zone of the station, a portal electric-eye device automatically "frisks" clothes and shoes as personnel pass by. If radiation is detected, an alarm sounds in the station control room and the person is required to clean up before proceeding.

However, Don Tremain by-passes the monitors because he's coming on shift. Nearby, he picks up a film badge with a green stripe, indicating he's fully qualified to work in a radioactive zone, and a pencil-style dosimeter.

The film badge, which records external radiation exposure, goes regularly to the Federal Department of Health and Welfare in Ottawa, which keeps tabs on doses received by all nuclear plant workers. The personal dosimeter, which is regularly calibrated, keeps a running check on the amount of radiation exposure received in work areas.

While Don Tremain's name is fictional, he represents the typical mechanical maintainer at Pickering. Before coming to the station in 1969, he took training at Hydro's Nuclear Training Centre at Rolphton, Ontario, and the nearby Nuclear Power Demonstration (NPD) plant, and served a stint at the Douglas Point nuclear station, near Kincardine.

Along the way he has taken 250 hours radiation protection training in lecture rooms, laboratories and in operating stations. By now, radiation safety has become as natural as looking both ways before crossing the street.

Entering the locker room, Don sheds his street clothes and shoes and puts on freshly-laundered "whites." He changes into a pair of yellow-and-black safety shoes which must be cleaned and left on a rack when he returns from work in the "operating island".

Sounds complicated, yet in a few minutes he's ready for the day's work. But everywhere there'll be indications of the safety precautions taken to protect nuclear workers.

Passing along a corridor, he encounters an air sampler which will flash lights or sound an alarm if radioactivity is present. Gamma monitors are situated in certain locations to sound a warning if the powerful X-ray type radiation is present. Chalkboard signs give up-to-date radiation levels in locations where radiation fields exist.

In Ontario Hydro stations each person is trained to be responsible for his own safety. So Don will pick up a "workhorse"

– a way of life



Tritium analyzer at Pickering health physics lab to determine internal body exposure of radiation workers.



portable gamma meter, check to see if it's in working condition, and carry it with him on his rounds. A sensitive instrument, the gun-shaped meter measures dose rates in thousandths of a rem per hour.

By law, the whole body exposure of a radiation worker is limited to five rems a year. But in practice a worker would be relocated to a non-radioactive part of the station before his exposure reached this limit.

(Individual members of the public, including those who live in the neighborhood of a nuclear plant, cannot be exposed to more than 0.5 rems a year. In practice, actual exposure has been estimated to be .005 rems per year, about what an airline passenger would receive from cosmic rays on a round trip flight between Toronto and Vancouver.)

The idea is to minimize exposure within well-defined limits which have a very low risk of harmful effects. For example, a person may receive several rems in a typical dental X-ray or in a whole body diagnostic X-ray.

The highest occupation dose received by a worker employed in an Ontario Hydro nuclear station is 37.6 rems in 10.5 years, or about 3.5 rems per year. The average for all atomic energy workers is much lower.

"Even the combined risk of exposure at occupational dose levels plus several X-rays annually is very low," says Robert Wilson, Hydro's manager of health physics.

"Occupational maximum dose levels are a bit like a speed limit of say 30 m.p.h. Driving in excess of this is not necessarily dangerous."

Mechanical maintainers as a group are frequently exposed to controlled amounts of radiation at Pickering and other stations because of the nature of their jobs. They carry out maintenance on all mechanical equipment, ranging from turbines and control rod mechanisms to the fuelling machines in the heavily-shielded reactor vault.

One of the jobs involving exposure would be working in the fuelling machine service room where special radiation protection is required. Typically, two men

would work together to check out their air masks and plastic suits with transparent hoods. Before proceeding they would check on existing radiation levels in the reactor building.

To gain access to the reactor building, they pass through an air lock. The door swings open and closes automatically behind them. Then the opposite door opens to admit them to the reactor building. Yet another door gives entry to the fuelling machine service room.

Suppose a radioactive part of the fuelling machine has to be removed from the reactor building. First, it would be wrapped in plastic, then taken to a decontamination room in the service wing for cleaning.

Strict regulations govern the shipment of all radioactive materials. The part would have to be deposited in a lead flask if it were to be transported to a supplier.

"A special permit would be required to ship the flask from the station," says Don Watson, senior Pickering health physicist. "If the receiver does not have a licence to handle radioactive materials, a person fully trained in radiation protection has to accompany the vehicle.

"A person can take home a watch with a radioactive dial from a downtown jewelry store," says Mr. Watson, "but he couldn't take as much radioactivity out of here without a permit."

When the morning's work is done it's clean-up time because the plant cafeteria is located outside the "operating island" and no food can be taken across the boundary.

Plastic suits and whites must be placed in special bags for decontamination or laundering. Shoes are cleaned and left on a rack. Finally, if a person has picked up contamination, there's a hot shower and a final check on the hand-foot radiation monitors.

Specialized backup services to protect men on the job are provided by Hydro's health physics department, a branch of the health and safety division. The department has been integrated with Hydro's occupational health program since 1958, four years before NPD came into service.

"Our physicians and health physicists represent an independent authority, interested primarily in employee health and welfare," says Dr. Donald K. Grant, health and safety director.

Health physicists are located at each nuclear station. Among other duties they provide basic training in radiation protection, refresher courses, bioassay and dosimetry services, environmental monitoring in the station vicinity and a general health physics advisory service.

Health physics expertise is also being applied to the design and commissioning of new nuclear units. For example, an experienced health physicist is attached to the design team for the 3,200-mw Bruce generating station, which is under construction.

A nuclear station uses defence-in-depth methods to protect workers and the public against radiation hazards. Besides a well-trained staff, these include shielding, controlled ventilation, fail-safe containment systems, automatic monitoring and alarm systems, remote control television and other devices.

The main objectives in health physics are to prevent acute doses, to reduce unnecessary exposure, to maintain doses within prescribed limits and to minimize the spread of radioactive material so that it does not enter the body.

Portable and fixed monitors located throughout the station check on external exposure to radiation. For internal radiation which may be absorbed by breathing or perhaps by a cut on the hand, more sophisticated techniques of surveillance are used.

Regular urinalysis and thyroid counting are practised to check on exposure to tritium and radio-iodine. A recent innovation is the use of a whole body counter as a final check to determine the adequacy of station radiation protection measures. Workers are examined at least annually for traces of radionuclides which may have been internally absorbed.

The person being tested is passed slowly under a large sodium crystal which indicates the presence of any gamma ra by emitting flashes of light. The flash are measured by number and intensity a sensitive instrument and the results corded on computer tape.

Hydro's whole body counter was dev oped under the guidance of Dr. Ka Wong, health physicist, and is based o design of a commercial unit operated California.

Similar examinations can be carried at Toronto General Hospital in a roo that's heavily shielded to screen out na ral background radiation. The relative inexpensive Hydro unit, shielded with f tons of lead, is trailer-mounted so that can be taken to various stations.

Dr. Wong said such surveillance me sures provide feedback which may used, if necessary, to implement furth protective measures.

Such precautions indicate why the n clear industry has been able to attain excellent safety record over the past years.

"There have been no deaths from acu exposure in approximately 100 milli man-hours of civilian nuclear power s tion operation in Canada and the Unit States," says Mr. Wilson. "This is an en able record which exceeds the perfor ance of even the safest industry report by the National Safety Council in t United States."

Occupational dose limits are select such that the chronic risk to workers low and carries a negligible probability severe injury, he said.

Behind this safety record lies 25 yea of unheralded effort. More, in fact, known about radiation than common pollutants and rigorous safeguards ha been imposed because the hazards a known.

Indeed, the nuclear industry has be suggested as a model for other industrie

Canada's radiation protection stan ards, administered by the Atomic Ener Control Board, are based on the work the International Commission on Radi logical Protection. This body was esta

lished in 1928 and has members from 14 countries.

These standards reflect the combined knowledge, experience and judgment of some of the world's most outstanding experts in such fields as radiology, radiation biology and health physics.

The ICRP recently completed a review of existing standards and issued a statement saying that "the commission does not see grounds for making any reduction in its dose limits for exposures to the whole body or of individual organs, either for workers or for members of the general public."

The statement underlined the ICRP philosophy that "all doses (should) be kept as low as is readily achievable, economic and social considerations being taken into account."

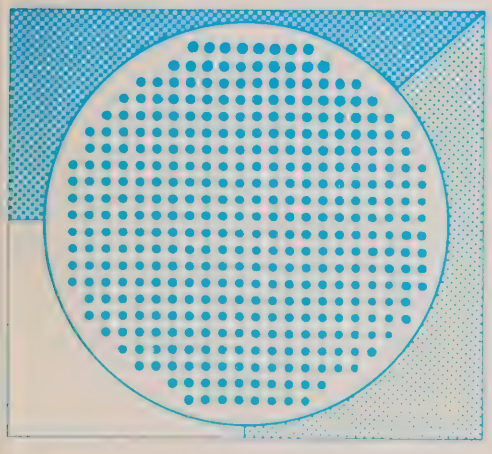
Suggesting a pattern for other industries in an environmentally-conscious age, ICRP standards are the basis for federal government standards on radiation exposure and for air and water quality. From these are established release limits for trace amounts of radionuclides, monitoring and recording of actual releases, the operation of stations well within these limits and environmental surveillance programs.

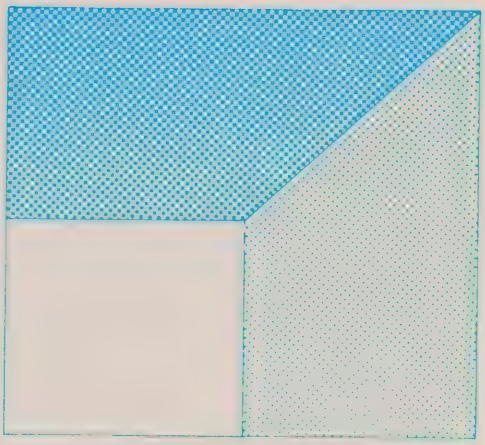
All things considered, the future looks bright for the Don Tremains who keep Ontario's nuclear plants tuned up. Many precautions taken to protect nuclear workers, in fact, help to ensure the safety of the general public. □

Nuclear worker sweeps monitor across counter top to check for radiation — a routine procedure at Pickering.



AECL SHELVES ORGANIC REACTOR





AECL has shelved the development of an organic-cooled reactor and will continue to give first priority to natural uranium-fuelled, heavy water cooled and moderated units of the type installed at Pickering generating station, near Toronto.

An organic-cooled reactor (OCR), similar to the WR-1 research reactor at Whiteshell, Man., would use an oil-like fluid instead of heavy water for heat transport. About 64 per cent of the heavy water required in a Pickering unit would be needed as moderator.

"The pursuit of a major OCR program, from development to prototype to commercial reactor, with an expenditure of at least $500 million could not be justified at this time," said an AECL statement. "The decision is, therefore, to set aside the organic power reactor program."

AECL said "first priority will continue to be given to support of the CANDU-PHW (pressurized heavy water) system." Chalk River will pay increased attention to the development of plutonium fuel for CANDU reactors in view of the large inventory of plutonium which will be accumulating in spent fuel in the 1980's. Complementary studies of the processing of spent fuel will be done at Whiteshell.

Longer-term projects will include the electrical production of neutrons by means of particle accelerators and the investigation and use of thorium as a fuel source. This will include study of the proposed thorium-uranium 233 fuel cycle in all CANDU systems, including the organic-cooled type.

Use of thorium, which is widely dispersed in rocks in the earth's crust, would reduce the drain on the supply of uranium. Electrically-produced neutrons would be a further fuel conservation measure.

AECL cited the cost, the priority of other programs and the lack of interest by utility systems as reasons for shelving organic-cooled reactor development. It would take 15 years or more from the time the program was launched until a commercial plant was in service.

AECL said an important consideration was that the organic-cooled reactor has yet to be proven out and would be competing against a Pickering-type system that has been firmly established on a commercial scale. In addition, considerable development effort aimed at improving efficiency and lowering capital and operating costs is being directed at Pickering-type units.

However, AECL noted that "the OCR could be a desirable route in the future."

The decision stems from a detailed design study of a 500-megawatt, organic-cooled prototype reactor which began in June, 1971, and which identified both advantages and possible disadvantages.

"To solve the problems and dispel the uncertainties would take . . . another year-and-a-half of development work," said AECL.

However, AECL said development work in progress particularly with respect to fuel, will be continued because of its value to the CANDU program as well as to the OCR.

The organic-cooled Whiteshell reactor will continue in full operation and work related to organic cooling and optimum fuelling will be "a significant part" of the program there.

Dr. W. B. Lewis, AECL senior vice-president, science, has previously cited the advantages of using thorium in superconverter or near-breeder reactors. These include improved neutron economy, higher fuel burn-up and longer intervals between fuelling operations.

Superconverters or near-breeders are seen as competition for the fast plutonium breeders because they can utilize thorium and eventually uranium-233. U-233, produced by the irradiation of thorium with neutrons in a thermal reactor, is considered a most promising fissile material. Residual U-233 bred from thorium could be sold or used in other reactors.

Low-cost neutrons are crucial to the concept. Possible ways of providing neutrons would be by using separated plutonium or enriched uranium to "spike" thorium to produce U-233. As already mentioned, another method would be the production of neutrons by electrical means in particle accelerators.

When hydro lowered the

U of T department of anthropology technician John Reid examines artifacts found near the site of Lower Notch generating station by archeologist Dean Knight, right. In lower photo, Mr. Knight's team searches the Marsh Bay excavation site, 20 miles upstream from the plant.

by Sheila Kenyon

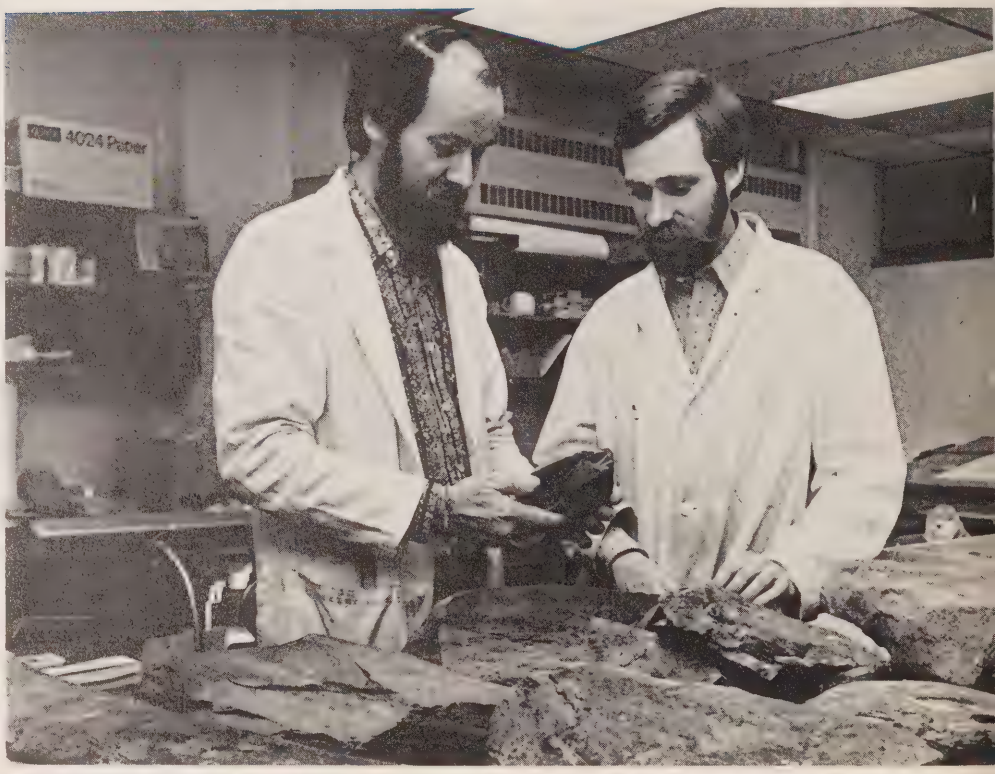




Photo: Dean Knigh

Late in the summer of 1971, two young archeologists were walking along a newly formed beach near the construction site of the Lower Notch hydro-electric plant in northeastern Ontario. Suddenly, one of them stopped. His trained eyes had spotted a number of fire-cracked rocks, exposed when the level of the Montreal River was lowered during the building of the generating plant.

Dean Knight, a graduate student in archeology at the University of Toronto, and his field director, realized they had stumbled upon an ancient campsite. Before Canada's early people discovered the art of pottery, they used other materials, such as wood, for cooking utensils. Because these primitive containers would be destroyed by fire, the ancient people dropped heated rocks into them, instead.

Closer inspection revealed a large archeological site. Unfortunately, it was nearing the end of the season and Mr. Knight's group had little time to do extensive work – but they did find seven other smaller campsites in the area.

The discoveries caused quite a stir among prehistorians. Archeologically, the district is almost unknown. Unlike southern Ontario where decades of plowing have unearthed numerous relics from the past, farming is practically non-existent on this part of the Canadian Shield and few artifacts have been found by local people.

Until 1971, there was only one known site in the Montreal River area. Artifacts tested by the carbon-14 dating process revealed the site had been used as far back as 5,000 years.

Around this time, man in Europe and the East was emerging from the New Stone Age. People were beginning to settle in permanent villages. The earliest known example of writing has been dated about 3500 BC. Civilization, as we know it, had just begun.

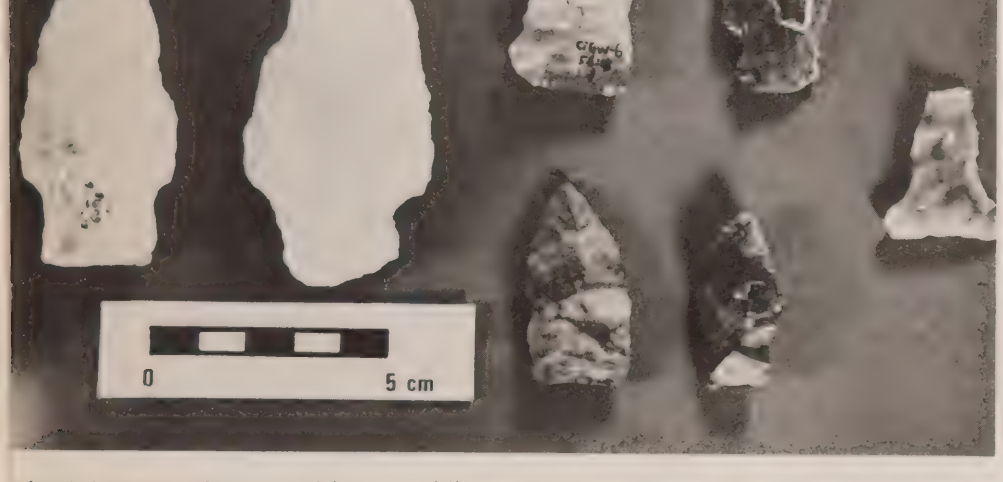
But the people living on the shores of the Montreal River lived a much more primitive existence.

Who were they? So far, archeologists have found no skeletal remains, human or

river

A stretch of the Montreal River was lowered last summer to enable U of T archeologists to explore Indian sites. They discovered artifacts dating back 5,000 years.

Artifacts, below, include tools and projectile points used by Indians in the area.



nimal, because the ground is too acidic o preserve bones. Mr. Knight believes ney were Algonquin-speaking people be- onging to the period of Canadian history nown as the Archaic period.

Archeologists classify the early people f Canada on a cultural basis. The first roups were Big Game Hunters, nomadic eople who followed the great herds that nce roamed freely across the country. ext came tribes who were more settled their way of life, known as the Archaic eople. Later followed the Woodland peo- le from whom the modern Indian is escended.

In 1615, Champlain, the first white man probe Canada's interior in pursuit of the Western Sea", described the land lying est of the Ottawa River as a "wilderness, eing uninhabited except by a few Algon- uin savages who dwell in the country and e by the fish they catch in the ponds nd lakes with which the country is well rovided." Mr. Knight believes the sites e uncovered were settled by early fore- ears of the Algonquins.

In 1969, the large campsite on the Mont- al River was excavated to a depth of ree and a half feet, unusual in an area here the soil depth is usually measured in inches. Today, the site lies buried under construction rubble from the Lower Notch spillway. But artifacts from the site are all neatly tagged and housed safely in Toronto.

As the "finds" in 1971 were so unexpected, Mr. Knight decided to return to the area to look for other sites. So last summer, Ontario Hydro agreed to help by lowering the water level of one of the sections of the river from Latchford Dam to Hound Chute Dam. Dropping this 10-mile stretch by three and a half feet exposed the old shoreline and allowed the archeologists to excavate. Results were better than expected, with the location of three additional sites and complete salvaging of seven others.

Forty-two stone artifacts were uncovered, including arrow and lance heads, axeheads and hammerstones showing the marks where hands in the past have wielded them as tools. Mr. Knight has boxes of chipping debris formed during the manufacture of tools and arrowheads.

But he's completely baffled by several large stone artifacts. They appear to be a type of stone tool measuring about 8 by 5 inches. They could have been used as a kind of adze for woodworking. No other similar type of tool has been uncovered Canadian excavations.

Among the most intriguing finds are tw skillfully-crafted arrowheads of a miner known as Knife River Chalcedony, a tran lucent variety of quartz found in Nor Dakota and Southern Manitoba. How d these arrowheads come to be buried c northern Ontario shores? Were they trade from one tribe to another? Again, no on knows.

What, then, is known about these mys terious people who inhabited the hars land bordering the Montreal River aroun the dawn of civilization? "We do know th area was well populated," says Mr. Knigh "There were native people living to th north of the campsites we excavated. His torically, we know that a family would liv off 50 to 60 square miles of land. Familie belonging to the same tribe had one mai camp in which they would come togethe for part of the year."

The Montreal River site must have bee a large summer camp for about 50 to 10 people. When autumn came, the trib would split up and groups of two or thre families would winter on the scattere campsites some distance away. In th summer, the Archaic people lived off fis and hunted for black bear, beaver, squirre moose and deer. In winter, survival de pended on ice fishing and whatever an mals that could be killed for food.

Mr. Knight says he would like to carr out extensive research in the area fo another four to five years. "It hasn't bee exhausted by any means." He suspects too, that he will find indications that th area was inhabited earlier than 5,00 years ago.

The artifacts collected so far are a washed and neatly labelled. Eventually some will go into laboratory storage at th University of Toronto. Others will be sen to the National Museum in Ottawa, whic has supported Mr. Knight's work.

"Today," he says, "there is increasin awareness of the need to carry out arche ological investigations. Those sites on th Montreal River may play an important rol in understanding Ontario's prehistory.

ancient quest for survival

Scene typical of the area in which the Archaic period Indians hunted and fished along the Montreal River up to 5,000 years ago. Tribes held large summer camps, then split into groups of two or three families for the winter.

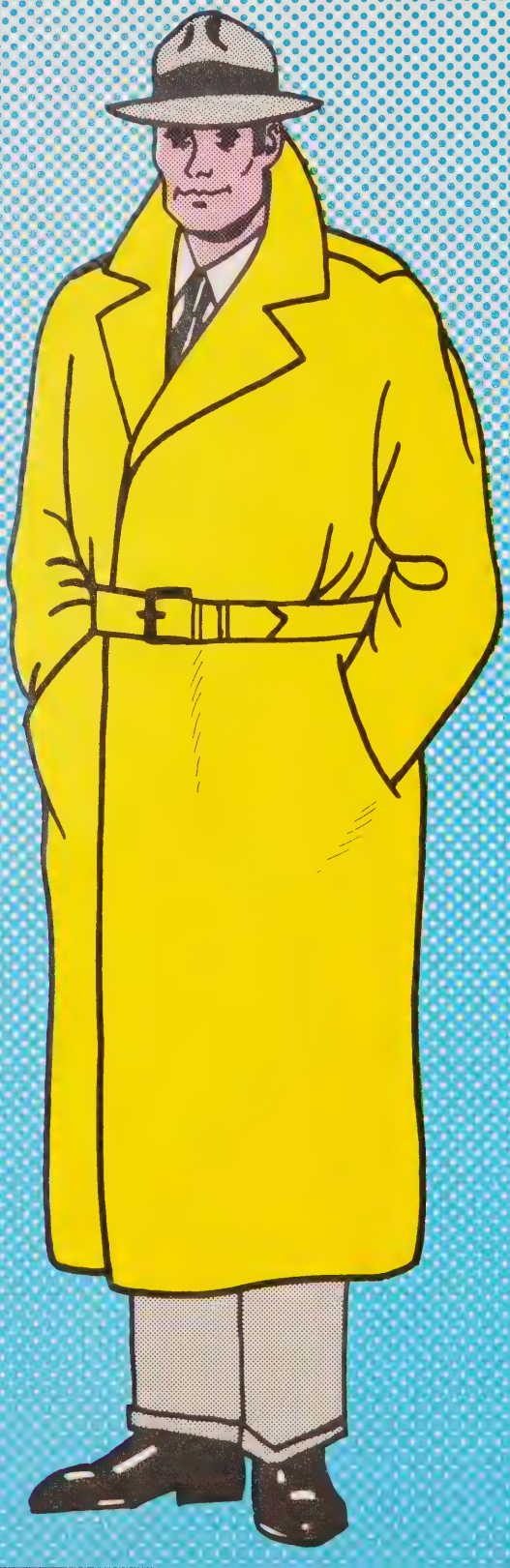


along the scenic Montreal

Photo: Dean Knu



SAFETY SLEUTHS



by BILL SETTATRE

The electrical inspector is no Dick Tracy, although he tracks down unsafe wiring and uncertified appliances with a certain dogged relentlessness. Hydro also has an intensive safety program to educate members of the public to protect themselves.

Every precaution may be taken to ensure hat electrical appliances and installations are as safe as possible, but the sad fact is hat it's virtually impossible to protect people from their own folly.

Because wiring in houses, stores and offices is concealed from view, the average citizen is not apt to worry about faulty electrical work. Nor is he liable to give much thought to the dangers of misusing electricity.

Hydro files are filled with case histories of fatal accidents that could have been avoided. Here are some examples from 971 when 28 people died in Ontario.

*A 44-year-old Toronto woman was putting a piece of carpet around an aquarium. A radiator in the apartment above had burst and the water had seeped through, soaking her carpet. Frayed wires leading under the damp carpet to the aquarium resulted in her electrocution when she touched the tank.

*A man was installing a light socket in is recreation room – a relatively simple ask, except that he happened to be tanding on an aluminum ladder and ame into contact with live wires. He died nstantly.

*Another do-it-yourselfer was electrocuted while working in his attic. His electric drill punctured the household wiring.

*A 14-year-old boy died when he fell rom a Hydro tower on to a 12,000-volt ne.

*Another 14-year-old was climbing own a television tower from the roof of is home with two friends. Their weight aused the tower to come crashing down n an overhead line. Two of the boys let o, but the third was electrocuted when e clung to the live tower.

*Another householder was carrying an luminum ladder to clean some windows hen it brushed against overhead lines. he outcome was the same.

*A young couple were house-hunting ith their year-old son. The baby crawled nto the kitchen of an empty house, spotted some loose wires for an electrical tove and put the bare ends in his mouth. he previous owner had neglected to remove the fuses. The child died later in hospital.

*Two men were working at a Sarnia concrete plant unloading blocks when the truck-mounted boom contacted a 4,800-volt line. They were electrocuted.

"Contact with overhead lines is by far the greatest single cause of electrical accidents," says Keith Bellamy, Hydro's chief electrical inspector. Of the 28 fatalities in 1971, 19 involved contact with power lines.

Mr. Bellamy points out that an aggressive safety program is under way to alert people about such hazards. Slogans like "Look up and live" and "Lower the boom for safety sake" are common in brochures and posters distributed throughout the province.

Safety has always been an important consideration with Ontario Hydro, and various methods are employed to get the message across. These include a school poster program, demonstrations and displays at exhibitions, television programs and spot announcements, films and newspaper items. A number of brochures have been published and are available for distribution.

The school program is being expanded with the co-operation of the Ontario Provincial Police. Hydro has made display and demonstration units available to the OPP for use in familiarizing children on the subject of potential electrical hazards.

The Electrical Utilities Safety Association, Construction Safety Association, Transportation Safety Association and Industrial Accident Prevention Association also work closely with Hydro. Safety education classes are held for utility employees, awards are made for in-plant safety, accident prevention posters are distributed to industries.

To track down hazards and enforce standards, Hydro deploys an army of 225 electrical inspectors across the province. Most of their work involves wiring and electrical installations.

A more affluent society has brought about increased use of electrical appliances, which points up the necessity for adequate or improved wiring. However many homes are not equipped to handle the load imposed on them. Overloaded circuits are often the cause of fires especially when a homeowner replaces a 15-amp fuse with one rated for 30 amps.

The wise home buyer should look for ample service entrance capacity and sufficient circuits to provide safe and efficient operation of all the appliances he intends to use.

In 1923, a group of far-sighted electrical men adopted the "Red Seal" as a standard for the "ultimate" in household wiring. By 1969, the Ontario Electrical League and Hydro's inspectors had succeeded in having the provincial electrical safety code amended to the point where "Red Seal" criteria such as 100-amp services, split connections to outlets and grounding were mandatory.

(With split connections, each outlet on a twin receptacle is wired to a separate circuit on the fuse panel. In other words a toaster and a kettle could be plugged in side by side without blowing a fuse. The grounding regulations allow for the extensive use of three-pronged plugs, the third prong being grounded for protection against shock.)

The most recent safety feature was introduced in 1971 when legislation was enacted requiring that new stoves and dryers be sold with plug-in connections and that new homes be equipped with receptacles to handle them.

The move was designed primarily for safety although convenience was also a factor. A promotional program to this effect had been spearheaded by both Sarnia Hydro and London PUC. Both utilities have made adapter plugs available to customers at cost since the early 60's.

"Actually, we were interested primarily as a means of saving money," says A. L. Furanna, manager of London PUC. The two utilities had been providing free stove and dryer hookups for years to customers moving in or out of homes. In London, this service costs $30,000 each year and about

4,000 new stoves and 1,500 dryers are connected free.

Electrical inspection first appeared in Ontario about 1892 as a function of the Canadian Fire Underwriters Association. Areas of operation were confined to Toronto and inspection limited to clients of the fire insurance companies.

In 1912, the Power Commission Act of Ontario was amended to give Hydro the authority to enforce regulations throughout the province. Inspection has progressed to the point where today every time the wiring in your home is changed, even to add another outlet, a Hydro inspection is required by law. Henry Lurie, Hydro's inspection engineer, says electricians sometimes take short cuts and neglect to apply for a permit. Consequently, wiring changes are not always inspected.

"The laws are there for public safety and should be obeyed," he says.

Do-it-yourselfers quite often contact the electrical inspection department with questions pertaining to wiring.

"They are quite welcome to do the wiring themselves as long as it's inspected," Mr. Lurie said. "We get about 40 or 50 inquiries a day during the spring and summer months. Many of them are from people who are building cottages and want to do the wiring themselves."

In the interests of safety, the inspection department has published a booklet on cottage wiring which is available on request.

At one time Hydro used to set the standards for the electrical appliance industry. Its seal of approval was required on all appliances sold in the province and eventually the Ontario policy was adopted by four other provinces. The testing and certification was then transferred to the Canadian Standards Association and is now nationwide. Hydro still has a deep involvement with this independent organization and Hydro's chief inspector heads up one of the CSA's committees.

One hundred and fifty electrical standards must be met by manufacturers in gaining CSA approval for their products.

"In this way, the consumer is afforded some protection by buying CSA-approved devices instead of unapproved items that might be suspect," says Eric Wilkins, CSA's manager of inspection services.

"Also, many government agencies recognize the importance of compliance with standards and won't award contracts to firms lacking CSA certification."

Normally, CSA tests are made only on prototype items and to a certain degree the CSA relies on the manufacturer's desire for quality control. Tests include rating the product according to its capacity; operation at maximum capacity for prolonged periods to check for overheating and a test of insulation to withstand normal use and abuse.

The CSA tests every conceivable electrical item on the market. For example, rows of mechanical fingers in the CSA lab are used in an endurance test to turn light switches on and off 30,000 times – approximately their normal life. Devices are used to determine whether an electric iron can withstand the jolt of being dropped from the ironing board on to the floor. Other machines test the durability of the protective glass on television sets.

While it is illegal in Ontario to advertise, display or offer for sale electrical equipment not approved by CSA, it is being done and Ontario Hydro's electrical inspectors are seriously concerned.

Jim Little is the man in charge of this aspect of Hydro's inspection program. "We check everything ranging from large asphalt batch plants to mini-hair dryers," Mr. Little said. "It's surprising the type of garbage that's available today, despite our efforts to protect the public."

He blames much of the problem on the availability of low-cost imported items and on competition in the marketplace. His department has raised the ire of many a supplier or manufacturer. In one instance, there were red faces when the inspectors discovered that a large computer installation at Hydro's Head Office was unsafe for a number of technical reasons. The computer company was required to bring its equipment up to standards.

Last fall, on the eve of the Grey Cup

There's only one safe way to retrieve an object lodged in Hydro wires...leave the job to an experienced line crew.



game when football was uppermost in the minds of many people, inspector John Waller discovered an electric football game that was unsafe. He ordered 100,000 of them pulled off the market immediately. Nearby, another department store manager was arguing with inspector John Gilmour, who had discovered that a radio being advertised in a Christmas sales flyer was unapproved. The radio was withdrawn and the advertising supplement changed.

"The reaction by merchants varies. Some are quick to jump in and rectify a situation when we alert them to a hazard. Others will fight you every inch of the way," said Mr. Little.

His group prefers to follow the co-operative route since that is the quickest way to get results. Occasionally, distributors are prosecuted but this takes months of work and delays in the courts.

"And when safety's at stake, time is important," he says.

Last fall, the inspectors discovered that about a dozen different makes of mini-hair dryers were unsafe.

"They would curl your toes faster than your hair," said Mr. Little. The dryers could be purchased in small stores for about $5 and in some instances barbers were giving them away to their best customers.

The inspection department conducted a massive publicity drive to draw the public's attention to the hazard, but Mr. Little says he has no idea how many were actually sold.

"All we can do is stress that the CSA-approved label be used as the criterion and that items not bearing this label be disregarded."

But approved appliances are only as safe as the people who use them and the electrical wiring and outlets in which they are plugged. While human nature dictates that 100 per cent safety is impossible, Hydro's goal is to achieve as close a safety margin as possible. □

citizen pa

Increasingly, citizen involvement is becoming a part of environmental planning and protection and Ontario Hydro is fully committed to the participatory approach in the planning of new plants and transmission lines. However, as Hydro Chairman George Gathercole points out in this address to the University of Toronto Students Law Society, the participatory process can backfire to the detriment of all if it is badly handled.

Much of the damage done to the environment in the past was part of the price we had to pay to arrive at the level of material wealth, the degree of comfort and leisure that we enjoy. But now that we have attained a considerable measure of affluence, many of the short cuts that industries and individuals took in the past are no longer desirable nor tenable. We must now do what we can to correct past damage to the environment and prevent further deterioration in the future.

Active citizen participation has become increasingly a part of environmental planning and protection. It is not a panacea for all environmental ills, but it can and does make an important and valuable contribution to abating them. I am sure we are going to see more of it and we ought to understand its implications. Not all citizen participations are good.

To ensure that it is of overall benefit, citizen participation should be structured in such a way as to be representative – so that the general interest and advantage of society is not thwarted by small, aggressive groups who exercise an influence on decisions far in excess of their numbers simply because they are highly vocal. The majority of citizens, frequently silent, also have a stake in the outcome, and their wishes should be taken into account.

The absence of a balanced representation of opinion was noted by Dr. Omond Solandt at the public inquiry which he conducted into Ontario Hydro's proposed bulk transmission corridor between Nanticoke and Pickering. "In future hearings of this kind," he stated, "some effective way must be found to achieve a more representative cross-section of popular interest."

Representation should be wide enough to ensure that due consideration is given to the *total* environment – to the social and economic environment, not merely the natural environment. If in particular instances a choice may have to be made between livelihoods and some impairment of the environment, it is important that all aspects be considered.

Citizen participation must be part of a process which not only provides representative involvement by citizens, but also gives due regard to the advice of those who have specialized knowledge. Science and technology have helped provide standards of health, comfort and well-being which a generation ago would not have been thought possible, and I am convinced that it will only be through the application of these disciplines that we can achieve the type of society and life quality we want.

The participatory process I would like to see in action is one which provides an opportunity for citizens, planners, elected representatives and members of other area agencies to combine their experience, knowledge and goals in the creation of a plan that can be understood and supported by most of those affected by it. I confess that is not easily done.

Citizen participation usually occurs at the project level. People object to the location of a plant or factory, or a transmission and transportation facility, or some aspect of their operation. Opposition may take the form of a denial that the facility or service is required. Frequently there is a recognition of its value, but disagreement as to where it is to be located or how it is to be operated.

Citizen opposition to specific projects can frequently lead to new policy applications. I would judge that much of our body of air management regulation has been formulated in response to objections aroused by specific projects.

Basically, there are two approaches to public participation in environmental planning and protection at the project level. One is the tribunal approach. The other is so-called open planning. Our preference is for open planning.

In so far as possible, we in Ontario Hydro would like to avoid the adversary form of procedure. It embitters relations, and is unnecessarily formal, legalistic, costly and time-consuming.

We don't look upon ourselves as an enemy of the people. We believe the product or service we render is to the general good and has contributed to an improvement in the environment, not a degradation of it. We are eager to enhance the quality of life and wish to co-operate with people to that end. We do have to face realities. We can't have all the benefits and none of the disabilities. The world doesn't offer us that kind of paradise. There are tradeoffs. The goal should be to make them as small as we can.

We have always discussed our plans with provincial departments and municipal councils and planning boards. We are now operating under procedures that involve more citizen participation in the early stages. Details are still being developed but basically the plan is to hold a continuing series of meetings with citizens as well as with the town councils, planning boards conservation authorities and governmen departments. Our objective is to inform them of the alternatives available and t obtain their views on what would be th most acceptable from the community' point of view.

As part of this process we propose t have citizen advisory boards. In the cas of transmission line location, these advis ory boards will be established in countie or townships along the route.

We are doing our best to reduce an eliminate the undesirable environmenta

rticipation



side-effects of our operations and to give the citizens concerned a voice in the decisions that are made.

In conclusion, I would like to emphasize that citizen participation can be salutary. But too narrowly based or carried to extremes it can be self-defeating and costly to society. Delays in reaching decisions can create problems rather than solve them. The alternative may be environmentally more degrading than the project proposed. Let me give an example.

In September of 1962 the Consolidated Edison Company of New York announced its decision to proceed with construction of a 2-million kilowatt pumped storage generating station on Storm King Mountain. This station was estimated to cost $165 million and was scheduled to begin operation in 1968 to provide much needed peak electric generating capacity for New York City. Today, after numerous court battles with environmentalists, not a sod of soil has been turned and the matter is still before the courts. Even if approval is finally granted, the earliest the station could be placed in service is 1980.

The blackouts and brownouts which New York has experienced in recent years are attributable in part to the delay in reaching a decision, one way or another, on the construction of this plant. The situation has become so bad that the chairman of the Mayor's Inter-Departmental Committee on Public Utilities commented that "there has emerged a state of public concern with the unreliability of electrical power which is leading to an erosion of the people's confidence as to whether it is suitable to live, work or operate a business in the City of New York."

Instead of $165 million, cost of the Storm King project is now estimated – due to delays and subsequent inflation – at $400 million. As an emergency measure to make up for the absence of this station, Consolidated Edison was forced to install 2 million kilowatts of combustion turbine capacity – which produces electricity at a far higher cost than Storm King or, for that matter, any other type of generating capacity which could have been provided if a decision had been reached in reasonable time.

The ultimate irony is that the combustion turbines, by causing air pollution, pose an even greater environmental problem.

In almost any project, there has to be some trade-off. And even with the maximum citizen participation possible, it is impossible to please everybody. Someone has to make a decision and then get on with the job. □

a case study

Decisions on the routing of transmission lines between Lennox generating station, near Kingston, and the Oshawa area and between Bradley Junction, near the Lake Huron site of Bruce generating station, and Georgetown will be reached with the aid of open planning techniques. Members of the public are being involved at each stage of the studies through opinion surveys, interviews and public meetings. Similar methods are being applied to other major line projects.

Commonwealth Associates Inc., a large international engineering and environmental planning company, was retained by Ontario Hydro to undertake a comprehensive environmental analysis of the 1,200-square-mile Lennox-Oshawa study area. This analysis, which forms the basis for the study, looks at both the natural and the social environment.

Initially, the open planning approach entails the completion of an inventory of the area. This inventory includes information on topography, geology, physiography, soils, surface waters, vegetation and wildlife, existing and future land uses, communications systems and other features.

For example, official plans and zoning by-laws of municipalities within the study area are reviewed to determine land use policies while existing or proposed roads, railways and pipelines are recorded

Numerous other features such as towns, villages, churches, cemeteries, schools, parks and historic sites are also taken into account.

During compilation of the physical profile, municipal officials and interested groups and individuals are asked to state their objectives and concerns to help determine the importance of various environmental factors. Based on the assembled information, several alternative and environmentally acceptable corridors are drawn up.

Finally, in conjunction with all the interested parties, the most acceptable corridor is identified and refined to produce the specific route for the transmission lines.

Throughout the entire process, citizens are kept informed of the study's progress through local press, radio and TV. Public meetings are held at each stage.

Because public attitudes are constantly changing, as are social, economic and other conditions along a proposed route, Hydro has established a special group to assess public attitudes toward each project. Working with a public response analysis model (PRAM), this group is involved in both qualitative and quantitative studies, feeding back data into the organization for appropriate action. □

Area residents discuss pros and cons of transmission line proposal during break at an open planning meeting in Hockley Valley. Community will be affected by a 500-kv line running from the vicinity of Bruce generating station on Lake Huron to Georgetown.



along hydro lines



Full steam ahead

Through the efforts of a Canadian company, interest has been strong of late in the possibilities of geothermal energy – the natural heat of the earth's core – as one means of meeting North America's energy needs.

United Siscoe Mines Ltd. is drilling for steam in an Arizona cotton field, a venture which has prompted investors and speculators to raise their valuation of the company from $4 million last summer to as high as $60 million by mid-March.

Meanwhile, world energy experts, meeting at the UN, have agreed that geothermal energy is one of the most promising new sources of relatively non-polluting power.

Within 50 years, says one optimistic estimate, geothermal energy may become a resource even more significant than petroleum. At least 80 nations are thought to have geological conditions indicating a substantial reservoir of such energy.

But the experts also noted a number of obstacles to the full development of geothermal energy. These include the continuing reluctance of governments and industry to take geothermal energy seriously, the lack of systematic exploration of its potential, and the failure of most nations to exchange information on the subject.

The source of most geothermal energy is the molten rock, or magma, in the earth's interior. When underground water comes into contact with the magma, hot water and steam are produced. Where a large body of water is involved within a few miles of the surface, the steam and hot water can be tapped and used to generate electricity.

Environment to kinetics

Topics will range from the all-embracing subject of the environment to the specialized one of space-time kinetics at the 1973 Canadian Nuclear Association conference in Toronto June 17 to 20.

The event has been split into six sessions and will be augmented by tours of nuclear stations and other facets of the $4 billion Canadian-based nuclear industry.

A session entitled "Interface between the environment and the nuclear industry," will be conducted by Dr. O. M. Solandt. No stranger to either subject, Dr. Solandt is a former chairman of the Science Council of Canada and represents a one-man government commission investigating the environmental effects of a power transmission corridor in Ontario.

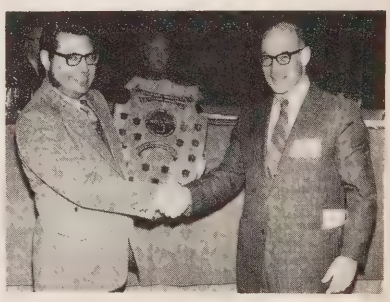
Financial imperatives of the nuclear program will be the basis of another session. This session will feature a panel discussion by representatives of the banking, uranium, utility and manufacturing fields.

The energy crisis has added emphasis to the financial community's interest in the nuclear field. Nuclear plants, despite their attractiveness as stable, low-unit-cost power producers, require heavy financing.

Other sessions will examine future patterns for the nuclear science industry in Canada and the progress of heavy water reactors. Reports will be heard on reactors in India, Pakistan, Japan and Taiwan.

A technical-scientific session conducted by Dr. W. B. Lewis, vice-president-research, Atomic Energy of Canada Limited, will feature reports on reactor physics, physical aspects of Japan's Fugen reactor, advanced heavy water separation concepts and space-time kinetics.

Winning ways



Safety shield

For the third year in a row, Owen Sound PUC has captured the Electrical Utilities Safety Association award for having the lowest accident frequency in its category, 15,000 - 60,000 man-hours worked.

Other winners declared at the 64th annual meeting of the OMEA-AMEU were Dunnville PUC, 0 - 15,000 man-hours; Niagara Falls Hydro, 60,000 - 250,000 man-hours, and Kitchener PUC, 250,000 man-hours and over.

Hanover PUC, which has not had a compensable injury from 1959 to the end of 1972, was

recipient of the president's award. A private contractor, Sutherland Underground Electric, also received a EUSA award.

EUSA president M. H. Kelly, of Atikokan, is shown presenting a shield to Owen Sound PUC manager J. A. Gurnham.

Nuclear forums

The Atomic Energy Control Board, the federal agency that licences nuclear installations in Canada, will hold public hearings about the siting of any future nuclear power plants if asked by area residents and other "responsible and appropriate public groups," says its head, Dr. D. G. Hurst.

Dr. Hurst added that to his knowledge the AECB has not received a request for a hearing to date.

The Pickering-type nuclear power reactor that Hydro-Quebec plans to build at Gentilly, next to an existing prototype reactor, is likely to be the first siting affected by the new approach.

For the anglers

Many species of fish are returning to Toronto Harbor because of the greatly improved water quality, say the Toronto Harbor Police.

First Officer Ernie Norrey says that carp, rock bass, pike, perch, blue gill, and even coho salmon have been spotted during scuba diving training sessions in the basin at the main harbor police station between York Street and Spadina Avenue.

These waters were devoid of marine life for years, the harbor police say.

First Officer Norrey attributed the return of the fish and generally improved water conditions to "government agency programs that have made the public more aware of pollution problems."

W. M. H. Colvin, secretary of the Board of Toronto Harbor Commissioners, says the board's own pollution control program "keeps would-be polluters on their toes."

By the old mill stream



Mill owner Norman Wright

The old Lowville feed mill isn't what it used to be.

Matter of fact the mill, near Stoney Creek, is home to contractor Norman Wright, whose passion for water power led him to purchase the old building a few years back and convert it into a charming country home.

And the old generator which used to power the machinery when the mill was in full operation is still there – under the dining room floor.

Mr. Wright acquired his love for generators from his father, a former Ontario Hydro engineer. Owning an old mill was an ideal way to pursue his hobby.

Restoring the mill wasn't an easy chore. The dam had to be completely rebuilt, the millrace cleaned out and the stonework replaced and grouted. The turbine generator was shipped back to Barber Turbines in Meaford, the only company in Canada still in the small turbine business. The generator needed a complete overhaul and refitting.

Now the equipment provides enough power to heat and light Mr. Wright's home, although he still has Ontario Hydro service and can change over when he wants to.

Argentina picks CANDU

Argentina has selected the Canadian CANDU reactor design for its next nuclear power plant.

The design was prepared and presented by Atomic Energy of Canada Limited. The Argentine decision represents the first success by AECL in competitive bidding on a foreign nuclear contract.

This success, as well as boosting morale among Canada's nuclear power authorities, is expected to bolster AECL's status in bidding on other foreign projects.

The Canadian bid was submitted jointly with Italimpianti, of Genoa, Italy. AECL will supply the nuclear portion of the complex, and Italimpianti will provide the conventional equipment. Over-all price for the 600,000-kilowatt

station is about $220 million, of which the Canadian share will be about $100 million.

The principals, AECL, Italimpianti and the Argentine Atomic Energy Commission, will enter negotiations with a view to signing a contract.

Information received by AECL says the Argentine junta decided in favor of a reactor fuelled with natural uranium for the nuclear power plant to be built at Rio Tercero, in the province of Cordoba, about 500 miles west of Buenos Aires.

The successful bid, which was submitted about a year ago, provides for a construction period of 59 months from the date the contract is signed. AECL's price on the nuclear part of the plant does not include the supply of heavy water, of which the plant will require about 600 tons.

To reduce the capital cost to Argentina, AECL has suggested that Canada supply the heavy water on a lease basis since the purchase price would be more than $30 million.

In getting the Argentine contract, AECL was chosen over several international companies in the nuclear field including General Electric, Westinghouse, both in the U.S., and Kraftwerk-Union of West Germany. The three were offering reactor designs incorporating the use of enriched uranium. Argentina does not possess enrichment capability, but it does have uranium deposits and the junta insisted on a natural uranium model.

In obtaining the Argentine contracts, AECL used the operating success of Pickering generating station, near Toronto, to maximum effect.

Four years in a row



That's consistency ...

It was a return engagement for all three winners of the OMEA-AMEU public relations contest when awards were presented at the annual convention of the two associations.

Roy Bishop, of Meaford, made it four years in a row when he took the prize for the best public relations program by a small utility. Mr. Bishop has developed a keen PR program in his utility and was stressing the importance of good public relations long before the OMEA embarked on an awards program. (See January-February, 1973, Hydro News).

Scarborough PUC is a three-time winner in the large utility category and East York Hydro has made it twice in a row in the medium-sized utility class.

Runners-up in the contest were Toronto Hydro and Leamington PUC.

In the photo, outgoing president Archie McGugan presents commemorative plaques to Meaford PUC Chairman Cliff Richardson (since deceased), East York Hydro Chairman J. L. Christie and Scarborough PUC Chairman R. E. Cavanagh. Looking on are Leamington PUC Chairman L. D. Pridding and Toronto Hydro Chairman R. R. Horkins.

Ex-OMEA president is author

Anyone associated with the town of Huntsville and its personalities will find a wealth of interesting anecdotes in "Head and Tails," the memoirs of George F. Hutcheson, a former president of the OMEA whose public utilities career spanned a period of about 40 years.

Mr. Hutcheson's work, which is virtually four books in one, is essentially a personal account of his life in Huntsville. Most entertaining, perhaps, is the fourth section which deals with incidents in his early youth. A short chapter in this section covers his association with Hydro. In fact, he headed the OMEA in 1948-49 around the time the organization gave its support to the province-wide frequency standardization program.

Between 1949 and 1959, countless pieces of electrical equipment were changed over from 25-cycle to 60-cycle operation as Hydro established a standard frequency to facilitate exchanges of power between interconnected provinces and states.

In the first section of the book, the author deals with the early history of the Muskoka district while the second section is devoted to Huntsville itself. The third section consists of a family history.

Among the many gems are the activities of a certain Dr. Howland, who around 1875 practised medicine in the lumber camps and settlements of the Huntsville area, receiving a small annual fee for which the individual received attention in the event of sickness

or an accident. Sounds like OHIP almost a century before its time!

"Head and Tails" is published by the Herald-Gazette Press, Bracebridge.

Must use power efficiently



Life member

Increased use of energy does not necessarily have to be environmentally destructive any more than advances in medical science are responsible for an exploding population, Ontario Hydro's general manager, D. J. Gordon, told delegates at the Ontario Electrical League's annual meeting in Toronto.

Mr. Gordon was replying to the proponents of zero growth, who, he said, "alarmed at the state of our planet and the increasing use of natural resources, suggest that electric power, and indeed other forms of energy, should be curbed and economic growth slowed or held at its present level."

He said it is important to recognize that rising consumption of electricity isn't the reason for increased economic growth, but merely the result of it.

"Our prosperity, and the very future of our economic society, depends to a great extent on electric power. Electricity is the cleanest form of energy at its point of use, and as an increasingly larger proportion of electricity is generated by nuclear stations it will become more environmentally desirable or acceptable.

"However, we are lavish users of energy, and as a society we will have to think about the effective and efficient use – and act accordingly," Mr. Gordon said.

He suggested that the OEL can play an important role, "because, surely, the development of standards to improve the performance of equipment and to ensure its proper installation go hand-in-glove with the efficient use criteria which will become increasingly important in the total energy picture.

"We must not only support efficient and effective use, but we must be seen to do so. There is no question that our marketing programs are criticized today because people think, albeit mistakenly, that we are only interested in growth for growth's sake.

"We will have to re-orient our marketing programs," Mr. Gordon said, "to turn the environmental problems into environmental opportunities."

Mr. Gordon, right, is shown receiving an honorary OEL life membership plaque from past president G. K. F. Pepper and incoming president J. F. Anderson.

Regional shuffle

Ontario Hydro's western region will be re-organized over the next few months, consolidating its present 11 areas into seven. Area offices to be closed as a result of the mergers are Wallaceburg, West Lorne, Stratford and London.

Hydro Chairman George Gathercole says consolidation of area offices is part of Hydro's continuing quest to achieve administrative and operating economies without sacrificing the high standard of service to retail customers in rural areas.

"It's part of a province-wide program of re-organization which affects a considerable number of communities, but achieves a saving to rural power customers of millions of dollars annually while ensuring a dependable supply of electricity," Mr. Gathercole says.

He adds: "These present mergers alone will save Hydro – and ultimately its rural power customers – $247,000 a year in operating costs. With rapidly rising prices, interest rates and labor costs, it is imperative that Ontario Hydro do everything possible to combat rising power costs."

Gold medalist

Atomic Energy of Canada Limited's president, Dr. J. L. Gray, has been awarded the professional engineers' gold medal, highest award of the Association of Professional Engineers of Ontario.

Dr. Gray's citation said in part that his award is being given for his contributions to "the development in the national interest . . . of a nuclear power system that is economic, reliable, and best suited to Canadian conditions and circumstances."

$4 million show

The Association of Municipal Electrical Utilities equipment show attracted more than 1,200 visitors from all over Canada and the U.S. to Belleville's fairgrounds in May. The largest equipment display of its kind, it featured products of Canadian utility suppliers during its two-day run.

Former AMEU president D. K. White said the million dollar package of equipment was expected to generate up to $4 million in trade during the exhibition.

"This is one of the few chances the utilities have to look at equipment and compare it with other suppliers' products without going all over the country to do so," Mr. White said.

Belleville's Chamber of Commerce took an active part in arranging the show.

Engineering fellow

Ontario Hydro's director of research, J. H. Waghorne, has been named a Fellow of the Institute of Electrical and Electronic Engineers of the U.S. for his "leadership in the management of utility research programs."

Mr. Waghorne was appointed director of research in 1967. Prior to that, he was engineer-in-charge of the electrical research department.

municipal briefs

The response wasn't good when Clinton PUC advertised recently for a journeyman lineman – male or female. Only two replies came from women, and it's believed they were both put-ons. One was from a Georgian Hotspur and the other from a Faith Hope. Miss Hotspur, apparently, didn't have a hope. Final blow: the man who was selected for the job changed his mind at the last minute.

Seeing people atop utility poles around midnight in London, Ont., isn't all that unusual. They're only changing the reels in their tape recorders. It's all part of a $50,000 London-Woodstock noise survey, commissioned by the Ontario Department of the Environment and city council. Findings will be correlated with similar surveys in Toronto and Hamilton to devise regulations on permissible noise levels for urban areas.

Air conditioning is catching on in Chatham. Use of electricity in the city increased 7.66 per cent last year, with the maximum system demand of 47,400 kilowatts being reached on August 24. This marked the first time Chatham Hydro has had a summer peak, says general manager C. L. Leach.

A 22-year veteran of the Windsor Utilities Commission, Malcolm J. Brian, has died. Mr. Brian, a former chairman of the utility, retired from the commission in 1970.

North Bay Hydro's new manager, Robert T. Williams, is settling into the job after taking over from B. M. Graham, who retired earlier in the year. Before his appointment, Mr. Williams served as the utility's assistant manager and manager of administration.

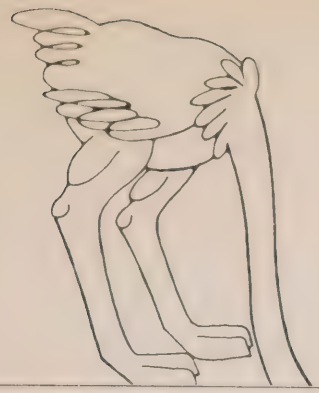
Robert Blaney Hanna, who served as manager of Listowel PUC for 43 years until his retirement in 1964, has died. Mr. Hanna was 85.

Congratulations are due to North York Hydro, which this year celebrates its golden anniversary.

Earl Jacob (Jake) Bryant, for 22 years a member of Whitby PUC, has died. Mr. Bryant served as chairman of the utility for three terms and was its vice-chairman four times.

It was Stan Darling night in Burk's Falls. More than 200 friends, colleagues, and even political rivals attended a dinner honoring the man who has served the community for 31 years – 26 as reeve and five as a councillor. Mr. Darling was also the first chairman of Burk's Falls PUC. He has been elected Member of Parliament for Parry Sound-Muskoka.

Cliff Richardson, veteran chairman of Meaford PUC,has died at age 65. Mr. Richardson, whose family boatworks built vessels for customers the world over, was first elected to the commission in 1955 and this year was in his 17th consecutive term as its chairman. He was one of the people instrumental in acquiring a new water filtration plant for the town, a big supporter of the utility's prize-winning public relations program, and played a key role in almost every civic function in Meaford.



as don wright sees it

f reading habits are any criterion, we are ow up one side and well down the other f that proverbial hill all of us are required o negotiate in the long day's journey into ight.

By this we mean that we found the Happy Hooker less titillating than Volume Two of the Advisory Committee on Energy. This is not to suggest that the two have much in common except that energy s an underlying theme of both books.

Miss Hollander manages to generate a retty good head of steam, but she leaves he reader with the impression that she's n for a real energy crunch unless she tarts paying more attention to the conervation of her natural resources. She akes the reader from climax to climax aster than the ACE report and implies oncern with things like return on investent, input and output, and government censing policies – but not necessarily h the same context.

By and large, we believe the average eader will put down the Happy Hooker vith the thought – is that all there is? le'll probably have the same thought hen he's done with Volume Two, but this me he'll be thinking in terms of energy nd Ontario – the poor little rich province ith the big appetite and the empty energy ırder.

It's pretty clear from the ACE report hat the Canadian Middle East is really ut west – in Alberta. That province emrges as the fat cat in the energy picture nd with an ear cocked to the Chinook ne can hear the faint licking of chops as ow country contemplates the effects of sing energy prices on its vast stores of as, oil and coal (not to mention hamurger). But it should think twice before resorts to gas warfare with Ontario. We ill have lots of uranium and if we can eal the necessary blueprints we should e able to drop some pretty big bombs our own.

We also learn that some 170 million ns of mineable lignite lie buried in the rthern part of Ontario in the Moose ver basin. One of the problems is that nite, which is half-way between peat and bituminous coal, is almost 50 per cent water. This ups transportation costs as the water content gets a free ride.

Patience is the answer here. Left to its own resources, nature may eventually complete the process and turn our lignite into fully-fledged coal. Surely we can keep our shirts on for another few million years.

■ One of the biggest posers buried in the ACE statistics is the conservation-anti-pollution conundrum. What's sauce for the environment could help cook the conservationist's goose.

We take the lead out of gasoline, for example, and we'll need thousands of extra gallons of non-renewable resources to get us where we were going. Lead-free gas gives poorer mileage. The same kind of thing happens when we fit out our cars with gas-gobbling emission control devices. It's a great anti-pollution move, but tough on resources.

There is one consolation. If we run out of energy, the other problem will go away. Without industry, transportation or heat there won't be much pollution. And we'll be too busy hoeing the cabbage patch to worry about what's left.

■ The myth seems to persist that if we all give up polishing our shoes and cleaning our teeth with electricity we'll be well on the way toward solving both the pollution and energy problems. ACE makes it clear that the use of electric appliances in homes is not a major factor in the consumption of energy.

In 1970, only 28 per cent of total energy consumption in Ontario was accounted for by the residential and commercial sector. Of this, about 75 per cent was required for space heating.

Narrow this down to electric appliances, and down again to the toothbrush and other piddly uses and we end up with a load Lambton G.S. could handle with a squirt of charcoal starter and half-a-dozen lumps of coal. Gas-burning Hearn could do the job and scarcely break wind.

■ We are not among those people who get their funnies from kicking Uncle Sam in the derrière whenever they think he isn't looking. Just the same, the U.S. government really let us down on the women's lib issue. They've officially sanctioned the Ms. idiocy as a prefix, identifying it as "an optional feminine title without marital designation."

As such, it's been included in the revised edition of the Government Printing Office's style book, but with some reluctance judging by one printing office official. "It's not a true abbreviation," he said, "because it has no spelled-out form, no accepted pronunciation, no plural and no foreign language counterpart."

No accepted pronunciation is right. Anyone we've heard trying to cope with the thing comes out sounding like an off-beat bumblebee.

■ And there is another affront to the language being put forward in the name of sexual equality. Headlines in an Ontario newspaper recently proclaimed the appointment of the local utility's first woman "chairperson." And this bizarre practice may be in danger of spreading.

The trick here is to strive for neutral ground by substituting "person" for "man" wherever this no-no appears in a word. Thus we have "manoeuvre" replaced by "personoeuvre" and the euphonious "mandolin" replaced by the horrendous "persondolin". Women themselves become wopersons and every female is a feperson.

It sounds to us like a lot of horse personure.

■ And now for our quote of the month. Anyone identifying the source correctly gets a free copy of the Role and Place report by Task Force Hydro.

"In our opinion the time has come when, having regard to the conduct of public business under our system, the Hydro-Electric Power Commission should be discontinued and a new Department of Power created which could take charge of this great work, and the head of which should be a cabinet minister."

Sorry about that – the speaker was Premier James Whitney and he held forth in this manner in an election speech in 1911. □

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60 years of research



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features

2 John Q. Public, planner

New planning procedures allow members of the public to play an increasing role in the routing of transmission lines and the siting of generating plants.

6 The social context of power generation

Comments by Ontario Hydro's Chief Engineer, H. A. Smith, on the possible effects on electric utilities of the present climate of social involvement.

8 An easy way to rough it

All-electric tents, complete with furnace and 100-amp service, are being erected on a Durham, Ont., campsite.

11 Energy carrot brings in the business

Hydro's vast expenditures in the energy field are being used to encourage increased Canadian participation in the nuclear and electrical industries.

16 Stringing in the rain

Vehicles and equipment worth $2 million were displayed at Belleville in a show sponsored by the Association of Municipal Electrical Utilities.

18 60 years of research

A review of present projects and past achievements as Hydro's research division celebrates its 60th anniversary.

22 New energy policy

Ontario Premier William Davis announces proposals that will have far-reaching implications for Hydro and the municipal utilities.

28 Along hydro lines

Les Dobson, Editor

Paul Page, Design Direction

Isobel Morgan, Design

the cover

Hydro's director of research, Jack Waghorne, sits inside a full-size mock-up of DAMUT (an acronym for Ducted Air Medium Underground Transmission). The DAMUT concept is viewed as a possible solution to the problems of high-voltage underground transmission. For more on the activities of research division, which this year celebrates its 60th anniversary, please turn to page 18.

Cover photo: Bob Armstrong

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hydro news, volume 60, number 4

Published by Ontario Hydro, 620 University Ave., Toronto.

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Member of Corporate Communicators Canada.
Printed in Canada

VIEWPOINT

Wise use of electricity

Conspicuous is perhaps the best way to describe the appearance of a new pamphlet turned out by Hydro. Twelve pages in all, it's printed in black and white and costs about three cents a copy to produce. Equally unpretentious is the message. Did you know, for example, that it takes twice as much fuel to heat an uninsulated home as it does to heat a house insulated to modern standards? Or that grandmother's custom of switching off the lights when they weren't needed was a good conservation habit? These and dozens of other little hints contained in the pamphlet "The Wise Use of Electricity" are designed to help people get the most out of their electricity dollars.

The significance, of course, is in the philosophy. Why is Hydro suggesting measures which could reduce the demand for its product?

The change in advertising policy has not been dictated by any foreseeable power shortage, as has been suggested. It is the result of changing values and misinterpretation of the nature and objectives of Hydro's marketing efforts in some quarters.

For many years Hydro has been urging people to take full advantage of the abundant supplies of electrical energy available in the province. Suppliers of other forms of energy were doing the same. Costs were the over-riding consideration and Hydro was striving for a more balanced use of its facilities and greater production and distribution economies to keep rates low.

A number of factors have combined to undermine the credibility of this traditional approach. In an era when costs are continually rising, due to inflation and more expensive methods of generation, it is difficult to convince people that economies of scale and optimum utilization of equipment are significant factors. And with the growing awareness of the limitation of the energy supply, Hydro's advertising has been increasingly interpreted as simply a means of promoting greater electrical consumption.

In response, Hydro is shifting part of its advertising emphasis to the wise and efficient use of energy and has reduced this year's media advertising budget by more than one-third.

It should be recognized, however, that mass media advertising is only the highly-visible tip of the iceberg in relation to any effective marketing program. Hydro will continue to meet its responsibilities in this regard to its customers and the people.

The need for Hydro to continue a comprehensive marketing effort is very real if not always apparent. At the residential level, people have a right to enough information to help them make an intelligent choice in their uses of energy. They must be advised in matters of electrical safety, new developments, the performance of equipment, maintenance and Hydro's own policies and developments if they are to relate these things to themselves in terms of comfort, economics, usefulness and the responsible use of energy.

There is also a responsibility to participate with industry in finding the most effective way of using electricity and to suggest new ways in which this energy can be employed to improve performance. Farming in Ontario is another enterprise which has made great technological progress in the last several years – partly due to the intelligent use of electricity. Hydro will continue its efforts through marketing programs to keep these customers informed and up-to-date with regard to electrical technology.

Regardless of Hydro marketing, the demand for electricity will continue to grow. This is because most growth stems from population expansion, economic progress and new technological developments. Beyond this, electricity is expected to outstrip the growth rate of other forms of energy because of its versatility, flexibility in the use of fuels for generation and its increasing attractiveness from the environmental point of view.

Continued marketing will be essential in the face of this growth. Without a steady flow of information including technical assistance, development of standards and the provision of advice and direction in the use of this power an intolerable gap could develop between the supplier and the consumer of electricity to everyone's detriment.

Never before has energy supply and utilization been in a greater state of flux. Eventually, electricity, most of it nuclear, will emerge very clearly as the most desirable form of energy for many applications, both from the standpoint of resource conservation and the absence of environmental damage.

In the interim, the consumer faces some difficult choices in the use of energy and he will need all the assistance he can get in making his decisions.

The wise use of electricity is in step with the times and while the emphasis in Hydro's marketing will change with the needs of the day no form of energy is likely, ever again, to be regarded as either cheap or plentiful. □

JOHN Q. PUBLIC *planner*



by Les Dobso

About 70 people, most of them farmers, sa attentively in the gymnatorium of Arthu High School recently while a bearded pipe-smoking lecturer manipulated map and colored overlays on an overhea projector.

The speaker, an Ontario Hydro forestr specialist, explained that overlay mappin is a technique being employed in th selection of several alternative corridor to accommodate a major 500-kv transmis sion line together with a shorter segmer of 500-kv line that will pass through th area by 1975.

The overlays show such features a ecologically sensitive areas, prime agr cultural land which shouldn't be disturbe or places where transmission lines canno go such as towns or the area around a airport.

"We'll come back to you in Septembe hopefully with five possible corridors fro which two will eventually be chosen," sai the forestry expert. "Then it's a case refining each corridor, which may be ha a mile wide, until we have the specif routes for the two rights-of-way."

After his brief presentation, the sessio was opened to questions fielded by number of Hydro representatives. Ho close will a right-of-way come to a bar or other building? Can we use the lan beneath the transmission line? What abou radio and TV interference? If the right-o way splits a farm, at what stage will yo buy the entire farm? The question perio took up about 80 per cent of the meetin which lasted almost until midnight.

This was far from being a hostile crowd At the end of the meeting, a member the audience got to his feet. Hydro was good friend of the farmer in the earl thirties during the electrification of rura Ontario, he said. People had only to com pare how farm life had improved. Th utility deserved a great deal of credit. was, after all, only asking for a sma amount of land. The anonymous speake sat down to a round of applause.

The Arthur meeting, which drew a su prising number of people for a rainy, mis evening, was part of a bold program

Open planning for major generating and transmission projects is fast becoming the norm. But most authorities agree government should have final say.

citizen participation, or open planning. Eleven similar meetings were held over a three-week period in key communities likely to be affected by the line that will run approximately 80 miles from just east of the Bruce nuclear power development on Lake Huron to Georgetown.

Open planning techniques are also being applied to two other 500-kv lines between Lennox generating station, near Bath, and the Oshawa area and between Nanticoke generating station on Lake Erie and London. Indeed, the intention is to apply the participatory process to all major transmission or generating projects in the future. Extra high voltage lines form the major portion of a network that will be required by the mid-seventies to carry large amounts of power from generating stations now planned or under construction to areas of high electrical consumption.

There's little doubt that the need for citizen involvement is a response to the



spicing of environmental concerns together with a general awareness by people that, properly mobilized, they can exert considerable influence on events. The electrical industry has no better example than the U.S. nuclear construction program, which encountered serious delays due at least in part to restrictive legislation and the actions of environmentalists.

For Ontario Hydro, the watershed was the report of the one-man Solandt Commission, issued last year on the plan to build a 500-kv link between Nanticoke and Pickering, situated respectively on lakes Erie and Ontario. Although Hydro planned some fundamental changes in its transmission line policy – including the selective cutting of trees, the sowing of cover crops and alternative uses for the acreage along the right-of-way – Dr. Omond Solandt recommended further studies of alternative routes with increased citizen involvement.

Dr. Solandt said he believed the difficulties encountered by Hydro in reaching agreement with involved municipalities resulted, in part, from the lack of homogeneity in population along the proposed alternative routes, which all had to pass close to the Metropolitan Toronto area.

"In a small city, the urban dwellers form a reasonably coherent social group that is distinct from the rural community in which the city is embedded," Dr. Solandt said. "Even the suburban outgrowths of the city have more in common with the city than the country. However, as affluence increases and roads improve to the point where relatively long-distance commuting by private transportation is possible, a new species, the rural estate owner, begins to appear.

"The term appears to be used not as in the past to indicate a very wealthy person, but rather to indicate a person whose economic roots are in the city and who has chosen to live in the country often primarily to enjoy the relatively undisturbed natural environment."

Dr. Solandt recommended further studies on the Nanticoke-Pickering line. In spite of repeated criticism during the hearings, he found no real evidence that Hydro attempted to keep its plans secret. Rather, he said, Hydro was just uncommunicative.

In its final summation, Hydro offered an approach to open planning for the Solandt Commission's consideration. Dr. Solandt agreed with the approach and retained Bruce Howlett, a former planner for the city of Edmonton, to conduct further studies in spite of the delay they would mean in the start of construction.

Mr. Howlett, who has studied at the University of Alberta, the University of Chicago and Harvard University, says that to draw the public debate over siting into a framework for discussion and resolution, it is essential to start with a defined set of environmental topics which might be affected by the particular project.

He believes the list of topics falls into



seven broad groups: land use; physiography; natural resources such as vegetation; cultural and social values; visibility and visual quality; land ownership and land value; and future land development.

"When environmentalists criticize new transmission line locations, they are usually concerned with the impact of the line on one or more of these topics," he says.

All the environmental factors can be mapped, a highly visual form of presentation allowing possible power line corridors to be readily identified. The technique has the bonus of being easily interpreted for appraisal and discussion by a lay audience.

The open planning techniques developed by Hydro since the Solandt Report consist essentially of a distillation of the views of Mr. Howlett and other urban planners, techniques used in the planning

of recent highways in Ontario and the experiences of several U.S. utilities involved in the participatory process.

However, full-scale citizen involvement is a relatively new concept and techniques are still in the process of evolution. What's good for one project may not be good for another. The methodology suitable for planning a transmission line route, for example, may not apply to the siting of a major generating station.

One interesting approach to open planning was undertaken by the Northern States Power Company, which in 1969 set about the job of finding a site for a coal-burning station near Minneapolis-St. Paul. It convened a task force consisting of members of the major environmental groups together with government, university and company representatives.

In spite of some initial cynicism about the utility's intentions, the task force came up in three months with a recommendation which went against both the choice of the utility and the state's environmental cabinet. Nonetheless, the task force got its way along with every demand for environmental safeguards included in the report.

Dr. Solandt strongly opposes such relinquishing of final authority. In his report, he acknowledges that some witnesses implied that open planning should be carried to the stage where the public virtually makes the final decision.

"I strongly reject this view," he said. "I believe that all interested groups in the community should be given an early opportunity to express their views, not only in general but in response to quite specific proposals. Ontario Hydro should then evolve a plan designed to take account of all the views expressed and then present this to government for final decision.

"As long as we live in a democracy we must leave the final decision on major social and economic problems to our elected representatives," he added.

The idea of government having final say was backed up by Premier William Davis, who at the annual meeting of the OMEA and AMEU earlier this year indicated government acceptance of the open planning process in general.

Mr. Davis suggested that some form of environmental review board would be established to offer assistance in the planning and development of all energy-producing and transmitting projects. Its aim will be "to ensure that the power needs of the province are fulfilled while environmental considerations are taken into account."

He added: "An environmental review process could serve to identify the cost and the consequences – in terms of services and power needs – of not doing something in certain instances. In other words, it could assist in arriving at a realistic decision."

In practice, it seems likely that the agency responsible for each energy project will be expected to make its decisions based on input from the public. The decisions, as well as full documentation, will then go before the review board. The measure of their validity will be the extent to which the board feels further public involvement is necessary.

Yet another approach to citizen involvement was tried in 1971 in connection with



the routing of Highway 417 into downtown Ottawa. Being linear developments, highways produce similar planning problems to transmission lines in most respects, except for the distance covered.

In the Highway 417 study, citizens living in the affected area were invited to meetings where they were split into groups and asked to list their personal reasons for living in the community. As ideas were shared, goals were written on a blackboard and the implications for transportation solicited from the participants.

Information packages were distributed and the community groups were asked to prepare proposals. Technical studies went ahead so that after three and a half months, five technically sound routes could be placed before the public to test its reaction. After an intensive information campaign through the news media, citizens were able to select the final route by mailed ballot.

Desmond M. Connor, a sociologist involved in the Highway 417 project, is being consulted on a continuing basis by Hydro on its participation program. Apart from assisting management and staff from different divisions to co-ordinate their activities on citizen participation, one of his main jobs to date has been in a consultative role with Hydro project teams as they develop their public participation plans.

The project team, consisting of representatives from such Hydro divisions as forestry, transmission and distribution, property, public relations, system planning, stations projects and the regional offices, is responsible for gaining public acceptance for a right-of-way before construction can begin.

Under Dr. Connor's guidance, the teams have found it usually better to give the audience a chance to "let off steam" by throwing open the meeting to questions at an early stage rather than turn each session into a one-way lecture. Each question is written down for all the audience to see, then methodically answered. In this way, meetings seldom get out of hand.

Project teams are well briefed beforehand on the main attitudes and concerns of the local people, the views of key figures and interest groups in the community and the influence of the news media. This community profile even in-

ides an estimate of the number of ople expected to turn out to the meet-. Later, it's expected that additional dback will be provided by citizens' visory groups consisting of representa-s from the local community, special erest groups, government agencies and tario Hydro.

While public meetings are under way, a nprehensive inventory of the study area



compiled, including information on ography, geology, physiography, soils, ace water, vegetation and wildlife, ting and future land uses, communica-s systems and other features.

or example, official plans and zoning aws of municipalities within the study are reviewed to determine land use cies while existing or proposed roads, ways and pipelines are recorded for study to determine whether Hydro's t-of-way can run parallel to them.

umerous other features such as towns, ges, churches, cemeteries, schools, s and historic sites are also taken into unt. Municipal officials, interested ps and individuals are interviewed to determine the importance of various onmental factors.

roughout the entire process, citizens kept informed of the study's progress gh the public meetings and local s, radio and TV. Finally, in conjunc-with all the interested parties, the most acceptable corridor is identified and refined to produce the specific route for the transmission line.

In addition, Hydro is pursuing both qualitative and quantitative studies on public attitudes through a special group working with a public response analysis model (PRAM). Data gained from these studies is fed back into the organization with the objective of initiating procedural or policy changes where necessary.

Machinery is also being set up to apply participatory techniques to the siting of generating stations throughout the province. After determining the need for a new generating station and identifying and evaluating possible sites, Hydro will organize an advisory committee consisting of representatives from government agencies and public interest sectors. The committee's job will be to come up with a recommendation based on all available data, including input from the general public.

Undoubtedly, the advisory committee's conclusions will have considerable influence on Hydro's final recommendation, which will possibly go before a review board and then to the Ontario government for approval.

As yet, Hydro officials are approaching open planning with understandable caution. Chairman George Gathercole points out that the process must provide representative public opinion combined with due regard for the advice of those with specialized knowledge. If participatory decisions are too narrowly based or carried to extremes, they can be self-defeating or costly to society, he says. Delays in reaching decisions can create problems rather than solve them.

One of the major flaws in the participatory process is the problem of getting a representational body of opinion. Too often at public hearings it is the minority groups which are most vocal. Too often it is these minorities which are most successful in getting their views broadcast or into print.

Dr. Solandt was well aware of this deficiency. The silent majority were unrepresented at the Solandt inquiry, he said, and the Commission could only speculate on their feelings. He said that some effective way must be found to achieve a more representative cross-section of popular interest.

A large number of public meetings at the local level of the type now being held is a step in the right direction. But further techniques are being explored. Increased involvement through the medium of cable TV or through radio open-line shows offers exciting possibilities and Hydro is open to any suggestions to improve the dialogue.

Pointing out that participatory democracy may cause delays which may seri-



ously impair Hydro's construction program and consequently its ability to meet demands several years from now, Chief Engineer Harold Smith agrees that if the community insists on the full democratic decision-making procedure, it is not up to the servant utility to tell them they can't have it – only what the conditions and results will be.

"But we have not heard from the whole community," he adds. "And unless the majority get off their posteriors and speak out, how does the utility or anyone else know whether they would prefer to moderate the demands and constraints of the minority or suffer the power shortages which will otherwise occur?" □

the social context of power generation

Extract from the Hearn Lecture, presented in Toronto to the Institution of Electrical Engineers by H. A. Smith, Ontario Hydro's chief engineer.

During the 20th century, man has succeeded in developing and applying technology at a phenomenal rate to meet his ancient wants for material things, for urbanization, for security from contingencies, for leisure time and for personal freedom. By this means he has succeeded in producing a highly affluent, highly complex, highly socialized way of life, provided with almost instant mass communications and equipment and techniques for rapid analysis of complex problems.

In this development he has made rapid inroads into his energy and material resources. He has also, to a large degree, ignored the adverse impact of his activities on his environment. This fact, which has become painfully evident during the past decade, has brought a loud outcry from various quarters in the community for quick resolution of the related problems.

This evolution has culminated in some trends which, if not checked or moderated immediately, will result in the almost certain failure of utilities to meet their prime objective – adequate electricity supply.

The first of those trends is the presumption that because technology has been successful in so many applications, it is a magic wand that can be used to solve any and all social problems almost instantly. This, of course, is a delusion. Advanced as it is, technology is unable even to analyze, let alone solve, some of the environmental problems which confront society. Many years of extensive effort will be required before this is possible.

Second, the affluence achieved by our society appears certain to maintain, if not increase, the growth in energy demand, particularly for electricity.

Third, the trend towards urbanization, coupled with environmental concerns, requires greater concentrations of clean energy supply. Electricity is the most likely candidate for such an application since it can be generated at locations out of urban view and transmitted to the point of use. This puts the utility squarely in the middle of what amounts to an urban-rural confrontation between people's wants and the adverse environmental effects of large generating plant and transmission lines.

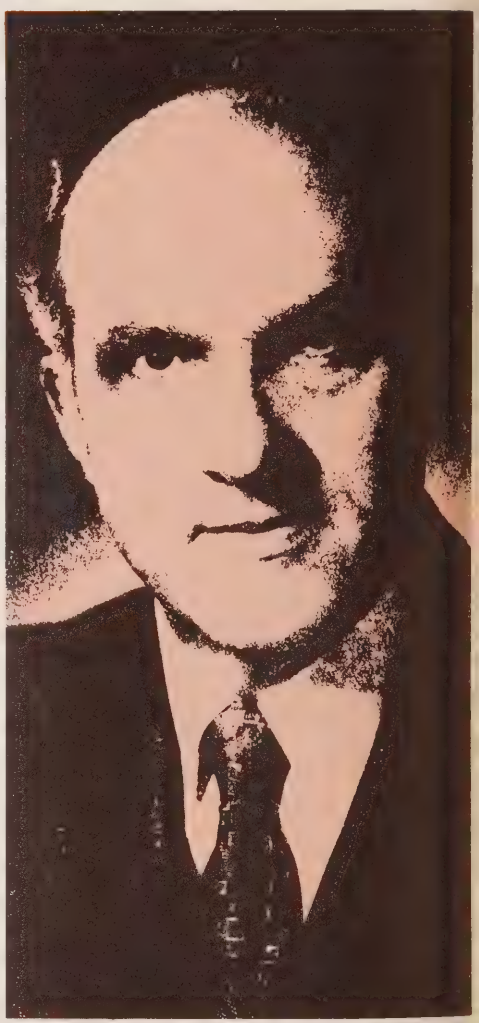
Fourth, the exponential growth in energy use has overtaken that of deliverable and useable energy resources, causing actual shortages in some locations and impending shortages of much greater magnitude. This has been accentuated by environmental constraints on the quality of fuels. The fact that such shortages relate more to logistics and discriminatory use than to any natural shortage is of little consolation to the utility that needs the fuel.

Fifth, the exponential trend of energy use has also broken through the community's tolerance level of adverse environmental impact, a level which has been falling as affluence has risen.

Last, but not least, there is that strong trend in our society which demands that attention be given to the views of individuals and groups, however small, whatever the subject of those views, and whatever their validity. In theory, this is a worthwhile objective in a democracy. However, since a wide disparity of views on most subjects is a certainty in almost any community, even the theory, to be consistent, must recognize that some method of resolving such disparities in favor of the majority is absolutely essential. Otherwise there is a very real danger of individual or minority views taking precedence over what is best for the whole community.

Unfortunately, no satisfactory method of rationalizing disparate demands has been devised. In the meantime, our mass communication media have focussed attention on minority views, particularly if these happen to be highly critical of large organizations such as the utilities or governments. This is not meant as criticism of the media, since they can hardly be expected to communicate the unspoken views of the majority.

This situation, however, has in effect magnified the issue to the point where minority groups have moved from the "right-to-be-heard" stand to the attitude that it is their God-given right to object on



H. A. Smith

y grounds – whatever their knowledge, agination, emotion or self-interest may termine; to object without factual basis with distorted or irrelevant information; intervene in critical processes; to de- nd an infinite spectrum of information d studies of questionable use or valid- ; to mind other people's business; and exercise all these rights without neces- ily understanding the issues, and with- t responsibility or accountability for ir impact.

Perhaps the most disquieting aspect of s trend is the lack of a mechanism for ionalizing the vociferous minority views d the unspoken majority views. In this spect, a quotation from the Solandt mmission Report is pertinent. Dealing h the route of an important planned nsmission line in Southern Ontario, Dr. landt says:

". . . Only those who were for some rea- on apprehensive about the impact of he (500-kv) line either on the environ- nent in general or on some specific eographical location appeared to state heir case. There were no representa- ives of the great silent majority and the Commission can only speculate on their eelings.

"It is certain that some, at least, of hem would not support additional xpenditure in order to protect the nvironment in general or individual roperties in particular. They might rge the building of the cheapest, sim- lest and most direct line in order to rovide abundant, dependable, low-cost ower to the citizens of Ontario. This iew was expressed in a few letters to he Commission, but no one came for- ard to support it at the hearings.

"In future hearings of this kind, some ffective way must be found to achieve more representative cross-section of opular interest. This is certainly not aid in criticism of those who did appear . . What is needed is an equally effec- ve presentation of viewpoints that ere absent from this hearing.

"The silent majority often complain hat they are dominated by small local interest groups. If in some cases this is true, it can only be counteracted by the silent majority becoming vocal. If open planning is to be effective, every shade of opinion must be heard."

If anyone thinks I may be over-emphasizing this trend, let that person review the record of the past 10 years in numerous communities in North America. The way is strewn with deferred and mangled plans of utilities, with serious deterioration of service quality and with actual power shortages.

Multi-year deferments of critical plant have occurred because of this trend, sometimes despite approvals granted by regulatory bodies. Those who assume that it can't happen here should be aware that deferment up to three years is already with us in Ontario for transmission facilities and deferment of generation seems inevitable.

This trend toward so-called public participation has an enormous impact on the utility business. It requires major diversion of expert talent into frustrating and nonproductive activities. It is responsible for gross incompatibilities among the demands the community places on its electric utility.

Positive, long-range decisions are vital if the utility is to fulfill its public responsibility. Today's utilities are not equipped to accommodate sudden extension of point-in-time decision-making into three or four-year periods to allow for public argument. To so equip them requires one of two things – a 10-year build-up of equipment reserves roughly double the current value in order to tide us over the period while we shift into a lower gear *OR* public acceptance of power shortages up to ⅓ of the demand over a three- to four-year period.

Now if the whole community really insists on the full democratic decision-making procedure whatever the results, it is not up to the servant utility to tell them they can't have it – only what the conditions and results will be. But we have not heard from the whole community. And unless the majority get off their posteriors and speak out, how does the utility or anyone else know whether they would prefer to moderate the demands and constraints of the minority or suffer the power shortages which will otherwise occur?

In a nutshell, the utility can't function well without good input from the community and from individuals. If the input continues to derive only from narrow-interest, active minorities, the utility soon will not even be able to meet the community's electricity demands.

The importance of timely decision-making in the commitment of generating plant can be illustrated by the fact that for each month of delay in the required commitment date, the deficiency in generating capacity seven years from now will amount to that now required to supply 40,000 typical suburban homes, or the total electricity requirements of the city of Oakville.

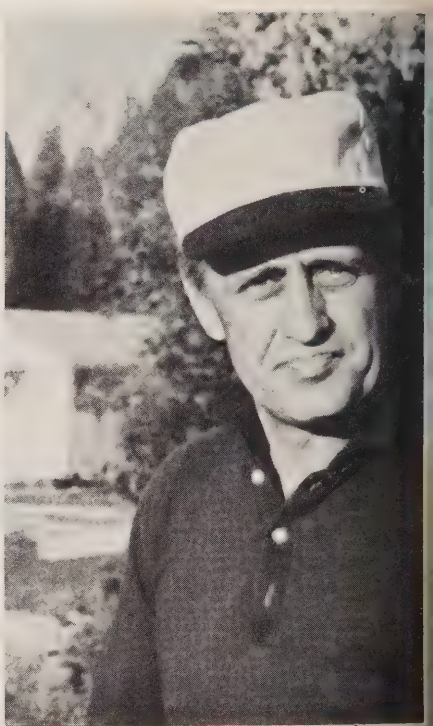
I suggest to you that the Ontario community as a whole does *not* want its demands and constraints to jeopardize the traditional level of performance of its electric utility. Certainly, it wants less adverse environmental impact, and it also wants electric service at a low price. But surely the community as a whole would be prepared to moderate such wants to a more realistic basis if it realized the consequences of failure to do so.

Obviously, the utility must get its message across to the whole community. And a real cross-section of the community must declare its position on priorities for power, price, public participation, protection of the environment and primary energy control.

Such communication is not easy. It requires that a rather complex message get to the customers, that they listen and that a majority speak. If the majority remain silent, they will find out what it's like to be silent in the dark. □

an easy way to ROUGH IT

All-electric tents for the camper who hates cold feet.



Bob Fowler

Story and pictures by Andy Turnbull

All-electric tents are Bob Fowler's bet for success in the tourist business. He's backed his choice with a $150,000 investment so far, and he's prepared to raise the stakes if the market looks good.

"I'm taking a big chance on this idea," he says. "But if Stonehills pays off, it will be worth it."

Stonehills is 85 acres of rolling woodland and open fields not far from Durham, Ont. There's a natural spring-fed stream on the property and Mr. Fowler has built a three-acre pond with a couple of islands in it.

He has five tents on the property now, with two permanent buildings. Materials are on hand to erect another five tents this summer. Sites are laid out and services planned for further expansion.

"I've always wanted to spend my vacation in a tent," Mr. Fowler says, "but conventional tents aren't very comfortable. Stonehills is a luxury resort and these are luxury tents."

Some people might argue about whether the tents actually are tents or not. But there's no doubt about the luxury.

Each tent has running water and a flush toilet; wooden floor, panelled walls and a nylon drop ceiling; a 100-amp electrical service and an electric forced-air furnace suitable for a small house.

The outside is a tent all right – a custom-made reinforced vinyl shell, stretched over a wooden framework with a 12 ft. by 26 ft. floor area. Included are a screened porch and a 4 ft. section partitioned off for bathroom and utilities.

Kitchen facilities comprise a single modern unit including a sink, 220-volt stove and refrigerator. Inside and outside furniture, kitchen utensils and bedding for a family of five are provided with each tent.

Most of the tent design is Mr. Fowler's own, but he went to industrial designer Frank Carter of Waterloo, Ont., for the heating system – a combination of radiant and forced air heat.

"I wanted a heated floor," Mr. Fowler says, "because when I'm in a tent my feet get cold. But I wanted a forced air system, too, so the heat would be even throughout.

"So Frank designed a sandwich floor – plywood and styrofoam – with the heat ducts running through it. Hot air from the

dulating landscape at Stonehills,
ar Durham, Ontario,
deal setting for luxury campground.



Using luxury tent as a planning office are electrical contractor Jack Breen, Bob Fowler and Art Brown, a building contractor and Mayor of Walkerton.



furnace is ducted through the whole floor area before it's released into the tent.

"It's a new idea and it works great – I've lived in one of these tents most of the winter and it's as warm as a house. We plan to stay open eight months a year, so that's important to us."

In addition to the 10-kw furnace and stove, each tent's 100-amp service powers inside and outside lighting and wall outlets – a total of 18 outlets and switches in each tent.

A sauna and laundry building on the property has a 200-amp service to power two Cascade 60 water heaters (rented from Ontario Hydro), two 6-kw electric sauna units and baseboard heating. A recreation hall nearby has 200-amp service to power a 20-kw furnace, a Cascade 40 water heater, a stove, refrigerator and small appliances.

Power is distributed underground throughout the property from two transformers on the site. A third transformer is planned as part of the second half of the development.

"We want Stonehills to be quiet and clean," Mr. Fowler says, "and we're already warning prospective guests that we don't want any gas engines around here. No snowmobiles in winter, no motorcycles or gas-powered outboard motors in summer.

"We don't even want to use gas engines ourselves, if we can avoid it. We're looking at a battery-powered electric tractor for maintenance around here and we're thinking of fitting some of the boats on the pond with battery-powered outboards."

Stonehills is one of two experiments Mr. Fowler is involved in this year. He's searching for a model for what might become a chain of resorts.

The other experiment is called Mirimachi, a development near Port Elgin on Lake Huron in which Mr. Fowler is in partnership with Jack Reid, of Kitchener. Mirimachi consists of six conventional all-electric cottages.

The partners own several other parcels of land in Grey and Bruce counties, and Mr. Fowler is considering other designs and layouts in his search for the ideal resort. One proposal he has considered would accommodate all his guests in tree houses. □

energy carrot brings in the business

Hydro spent nearly $400 million last year in contracts and other services, about half of it in Ontario. This lucrative carrot is being used to encourage increased Canadian participation in the energy field.

by Bill Settatree

Sometime next year, the provincial power network will start being monitored by a computer system provided by a company which moved to Canada following award of a $5 million Ontario Hydro contract.

F and M Systems Company, located in Malton, is a relatively small operation at present, but long-term plans call for expansion. The company is supplying computers and ancillary equipment for the data acquisition and computer system (DACS) at the Richview control centre in Etobicoke.

The contract includes computer hardware and software. It also involves design and construction of remote terminal units and the large control consoles complete with color cathode ray tubes for system monitoring.

The DACS project will improve the quality and efficiency of the Ontario Hydro power network. The remote terminals will be linked to the Richview centre and will provide readings, updated every two seconds, on the status of generating stations and transmission lines throughout the province.

Dennis Erwin, supply division's product engineer assigned to the DACS project, says the original F and M quotation called for only 1 per cent Canadian content. Subsequent negotiations increased this to more than 60 per cent. Written into the contract was a stipulation that the company establish a factory and project office in the Toronto area as well as arrange with another Canadian company for the design and integration of computer software.

TransData, of Columbus, Ohio, has also established a small plant in Weston, largely because of a $144,000 Hydro contract for computer transducers. Although employing only four people at present, the company expects its full range of transducers will eventually be assembled at the new plant for the Canadian market. Transducers are devices that convert energy into a useable form.

In both instances, the Hydro business was the stimulant to the firms locating in

Canada, says Mr. Erwin. But other factors were considered as well.

"For instance, TransData had been considering Canada for some time. The decision was partly based on the fact that export business to Britain may be more favorable from a Canadian plant with the U.K.'s decision to enter the European Common Market," he adds.

F and M executive Ted Ryden says his firm is active in the development of computers and data systems for the gas and oil industry, pipeline companies and municipal water distribution systems as well as for electric utilities. The company is also involved in other computer jobs. Mr. Ryden's most recent assignment was to develop the data centre at Seattle-Tacoma airport.

F and M Systems is a subsidiary of Fischbach and Moore, a U.S. corporation with a long-established Canadian operation.

The negotiations leading to the establishment of the two plants in Canada were in line with Hydro policy, which has long stressed Canadian manufacturing and materials in purchasing arrangements.

This philosophy is shared by the Science Council of Canada, which in a recent report said: "All three levels of government should adopt purchasing policies and procedures which provide much more favorable treatment for companies able to offer high Canadian content in their products."

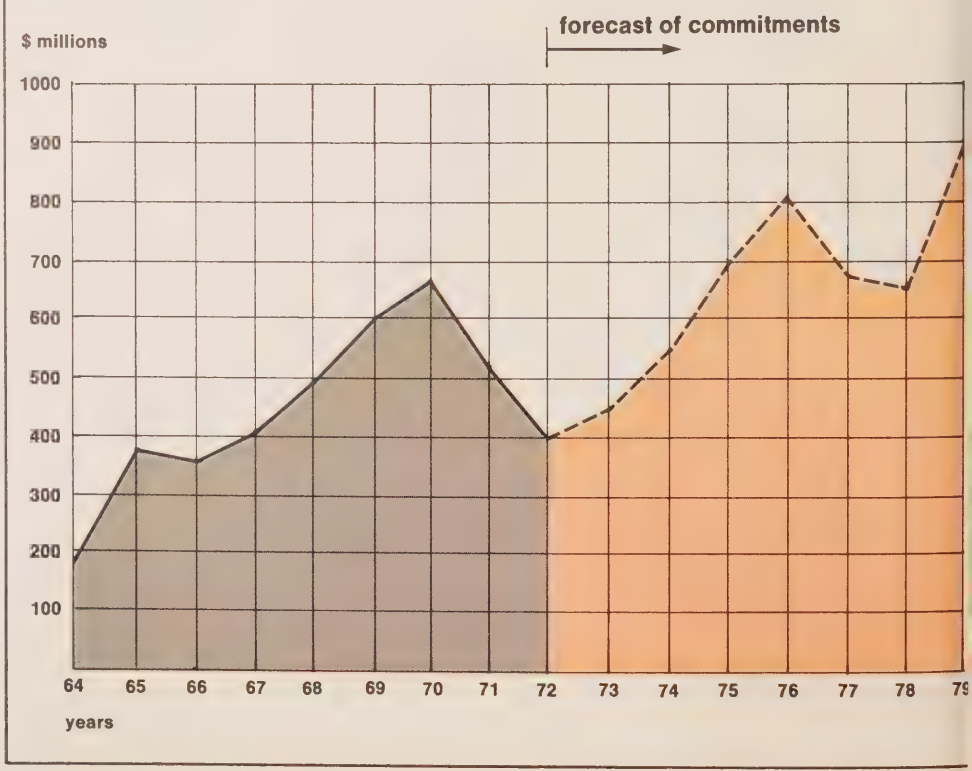
A few years ago, supply division established a planning and resources development department to ensure that all resources and manufacturing capabilities are available to meet future needs and to encourage Canadian participation where practical.

Department head John Matthew feels it's up to Hydro to keep industry informed of its requirements so that Canadian companies can develop the technological knowhow and supply capability.

Last year, Hydro spent almost $400 million in contracts and other services. Almost half that money went to Ontario companies while another 9.6 per cent was

Volume of Hydro purchases (actual and predicted)

note (1) All figures are in 1974 $ for comparison purposes
(2) Heavy water purchases are not included



spent in other provinces and 34.3 per cent in the United States. The balance was spread throughout Europe.

Coal, most of it imported from the U.S., represents 26 per cent of total expenditures. In fact, Hydro is Canada's biggest buyer of U.S. coal. (See King Coal's Comeback, March/April Hydro News). Recently, supply division negotiated with United States Steel Corporation for a 30-year contract that calls for the opening of a new Pennsylvania mine to serve Hydro exclusively.

If an order cannot be filled in Canada, a deal will often be negotiated with a firm which has a subsidiary in this country. The idea is to obtain a guarantee that the non-resident company will buy from its Canadian counterpart some product of equal value, thereby creating employment.

Such was the case for part of the heat transport system at the Bruce nuclear station.

"The heat transport pump motors were much more complicated than any such motors we had bought in the past," says Jack Slipp, electrical products procurement manager. "We did a detailed survey and found that nobody in Canada, the U.S. or Europe had produced what we wanted. After considerable searching and negotiations we selected Westinghouse Electric Corp. in Pittsburgh."

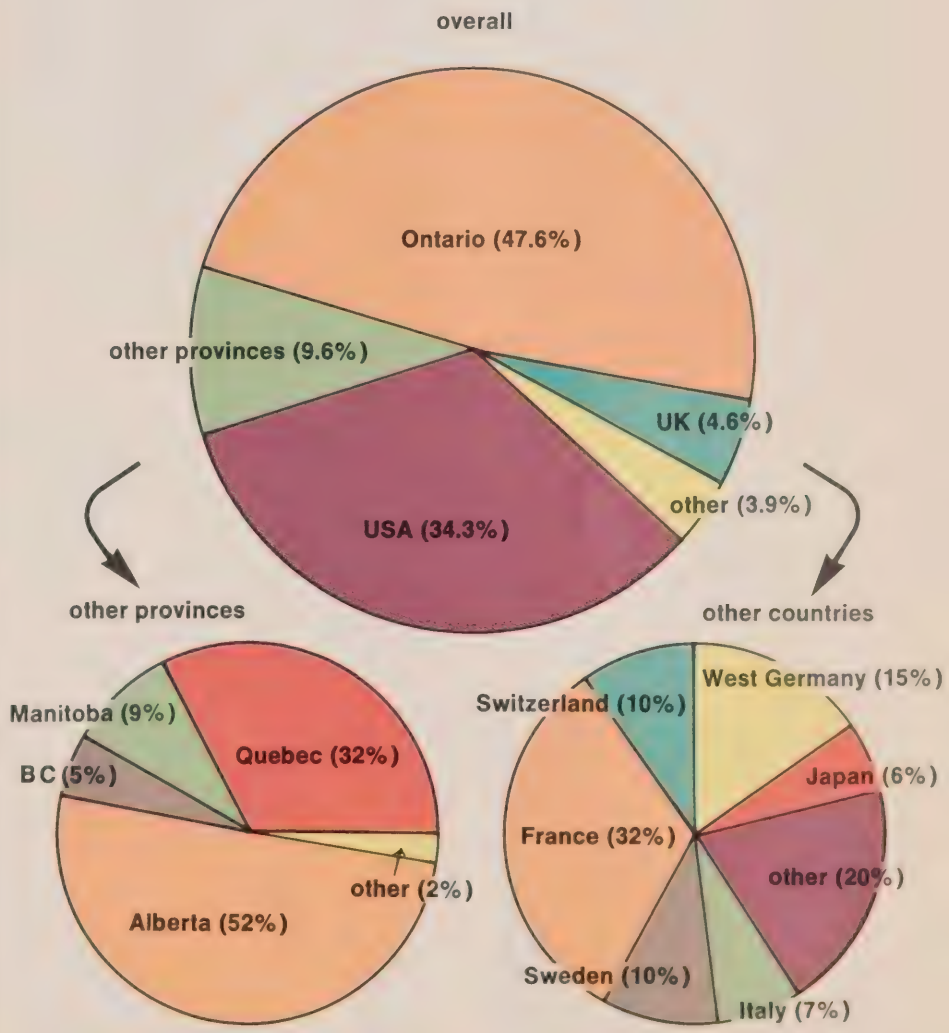
Under the agreement, Westinghouse Electric Corporation placed orders with Westinghouse Canada Limited for gas turbines for its U.S. customers. Well over 300,000 manhours of work went to the Canadian subsidiary's plants in Hamilton as a result of the pump motor order.

Mr. Slipp foresees more such arrangements. "Hydro, being as large as it is, has a responsibility to Canadian industry. But we must look at the Western world as an entity. Every country can't go off making everything it wants. Each nation should concentrate on what it does best."

Mr. Slipp says the federal government recognized this philosophy and has introduced rebates on duties on some manufactured items coming into Canada.

George Wilkinson, manager of utility

Total purchase value by point of manufacture — 1972



Byron Jackson

Looking much like an Apollo space capsule, the piece of equipment, right, is actually part of a nuclear heat transport pump being built by Byron Jackson for Ontario Hydro. Company vice-president Joe Meschino says the electric power business has resulted in tremendous expansion for his firm.

Joe Meschino





Howden Parsons

Canadian firms get a great deal of encouragement to participate in the provincial power program, says Bill MacOwan, president of Howden Parsons. Machine is used in the boring of turbine cylinders for large generating stations.

Bill MacOwan





sales for Westinghouse (Canada), says the arrangement has been so successful that all Westinghouse Electric Corporation's combustion-turbines are now built at the Hamilton factory. The plant enjoys world-wide sales.

"We achieved the 300,000-manhour goal stipulated in the contract in less than a year from the date the Bruce agreement was signed, and had far surpassed it before the first pump motor arrived in Canada," Mr. Wilkinson adds.

The Westinghouse motors are shipped to the Scarborough plant of Byron Jackson Division of Borg-Warner (Canada) Limited, which is building the heat transport pumps. This company, too, has undergone major development and expansion because of Hydro contracts.

"Hydro's impact on our company has been immense," says Joe Meschino, vice-president and general manager. "If a company gains acceptance from Ontario Hydro this stamp of approval goes over well with other utilities. Without Hydro we wouldn't have had the expansion and consequent capability to supply pumps elsewhere."

In 1958, the firm employed 70 people. Today it has 211 employees. Despite the expansion, Byron Jackson is not solely dependent on Ontario Hydro. Most of its business is derived from other sources.

Also in Scarborough, Howden Parsons Ltd. manufactures the huge turbine-generators for many of Hydro's thermal-electric stations. The company in its present form was established in 1963 at the time tenders were being called for the last turbines at Lakeview generating station, just west of Toronto. Up to then, the firm had been wholly owned by the Howden Company of Glasgow, and was manufacturing boiler air preheaters and fans of various types. CA Parsons Limited, of Newcastle, England, joined forces with Howden in 1963 to enlarge the Scarborough plant and also equip it for the manufacture of turbine-generators in addition to its established Howden products.

Again, it was Hydro's desire for Canadian content plus its indication of future requirements that encouraged the action.

President Bill MacOwan says: "Hydro's done a lot for our business and a hell of a lot for Canadian manufacturing generally. They don't just pay lip service to Canadian content. They actually go out looking for it."

Howden Parsons has built turbines for Pickering, Nanticoke and Bruce generating stations as well as Lakeview and stations in Quebec and the Maritimes. The company has more than doubled the size of its plant in recent years.

"The direct employment this provides is only the top of the iceberg," says Mr. MacOwen. "For each job we create in our plant, two or three others are created in the works of our Canadian suppliers. One plant in Quebec has employed more than 100 people in the manufacture of large castings for use in our turbine contracts."

Other examples abound. Canadian General Electric won a contract for the turbine-generators at Lennox generating station, near Bath. The $60 million job had a significant impact on CGE's plans for its turbine business at plants in Scarborough and Peterborough.

Harold Barnett, sales manager for the company's steam turbines, says the contract will contribute about 200 jobs.

When Hydro negotiated with General Electric in the U.S. for the Lennox job, the utility was anxious to maintain Canadian content. Mr. Barnett says an arrangement was reached for casings, diaphrams and crossovers to be made in Canada along with the generators themselves, while rotors and other equipment would be supplied by GE's plant at Schenectady, New York.

The final result was that the Lennox contract represented a minimum Canadian content of 30 per cent. CGE is making up the balance in exports of turbine components and other products to U.S. factories. In addition, the contract helped develop a competent, Canadian-based service and maintenance facility for turbine-generators.

Both CGE and Westinghouse (Canada) have expanded their operations to embrace the nuclear industry. CGE was on of the first companies to become involve by participating with Hydro and Atomi Energy of Canada Limited in the develop ment of the prototype nuclear plant a Rolphton in the 1950's. CGE also estab lished a nuclear manufacturing operatio at Peterborough and has become a majo supplier of nuclear fuels. Subsequentl the company built its own heavy wate production plant in Nova Scotia.

Westinghouse (Canada) recently em barked on further expansion of its size able nuclear capability with plans for zirconium tubing plant. Other companie deeply involved in Canada's nuclear pro gram include such giants as Babcock Wilcox, Canadian Vickers and Dominio Bridge.

With the advent of larger generatin units and the increased sophistication o equipment, rigorous steps are required t ensure workmanship is of the highes possible quality.

Twenty-eight companies are now work ing to meet Hydro's quality program requirements in the design and manufac ture of power generation products whil 166 other companies are using Hydro' specifications for inspection systems.

A recent study by the supply divisio indicates that Hydro's purchasing require ments will more than double in the decade Purchases are expected to reach $55 million next year then climb to an all-time high of $800 million by 1976, due in par to expenditures for 500-kv transmissio lines.

Purchases will likely drop off to the $650 million level in 1977 and 1978, the study says, but soar over the billion dolla mark in 1979 and 1980 as equipment pur chases for new generating stations reach a peak. In all cases, the estimates are based on 1972 dollars.

Canadian companies will be given every encouragement to participate in this vas amount of new business generated by rising energy demands.

STRINGING IN

For a time it looked like the show might not go on as $2 million worth of electrical equipment sat on a grassy island in the middle of the Belleville fairgrounds surrounded by a sea of mud.

The machines had been set up on the racetrack infield for a vehicle and equipment show sponsored by the Association of Municipal Electrical Utilities.

But there was no alternative. In spite of the weather, the show had to go on because 1,300 utility people from across Canada and the United States had converged on Belleville, filling every available motel room for miles around.

The soggy conditions didn't dampen the visitors' enthusiasm as they watched demonstrations of electrical equipment ranging from bucket trucks to tunnelling machines, rock crushers, winches and other hardware. It was a colorful spectacle. The rows of shiny bucket trucks looked like skyrides on a midway as operators put them through intricate manoeuvres. The brightly striped tents which dotted the fairgrounds added to the carnival atmosphere.

When it was all over, several concrete poles and mercury vapor lights together with transformers and overhead and underground cable were left as a gift from the AMEU to provide electrical service to the municipally-owned fairground.

The aim of the show was to permit utility people to see and compare products on the market and familiarize themselves with new techniques.

Co-operating in the demonstrations were Belleville Utilities Commission, Ontario Hydro and the Electrical Utilities Safety Association.

The demonstrations included installation of self-supporting concrete poles, underground cable tunnelling techniques, line-stringing, the setting up of a small transformer and rubber glove work on high-voltage lines.

The show was arranged by the vehicle and construction equipment committee of the AMEU. At one time, the committee published an equipment guide, but the book became so rapidly outdated that it was decided to put new equipment on display at regular intervals. The first show was held in Welland in 1958 and others have been held at Toronto, Scarborough, Niagara Falls, Barrie and Stratford. □











THE RAIN

In spite of the weather, the AMEU's $2 million equipment display lived up to the best show biz traditions. The show had to go on.



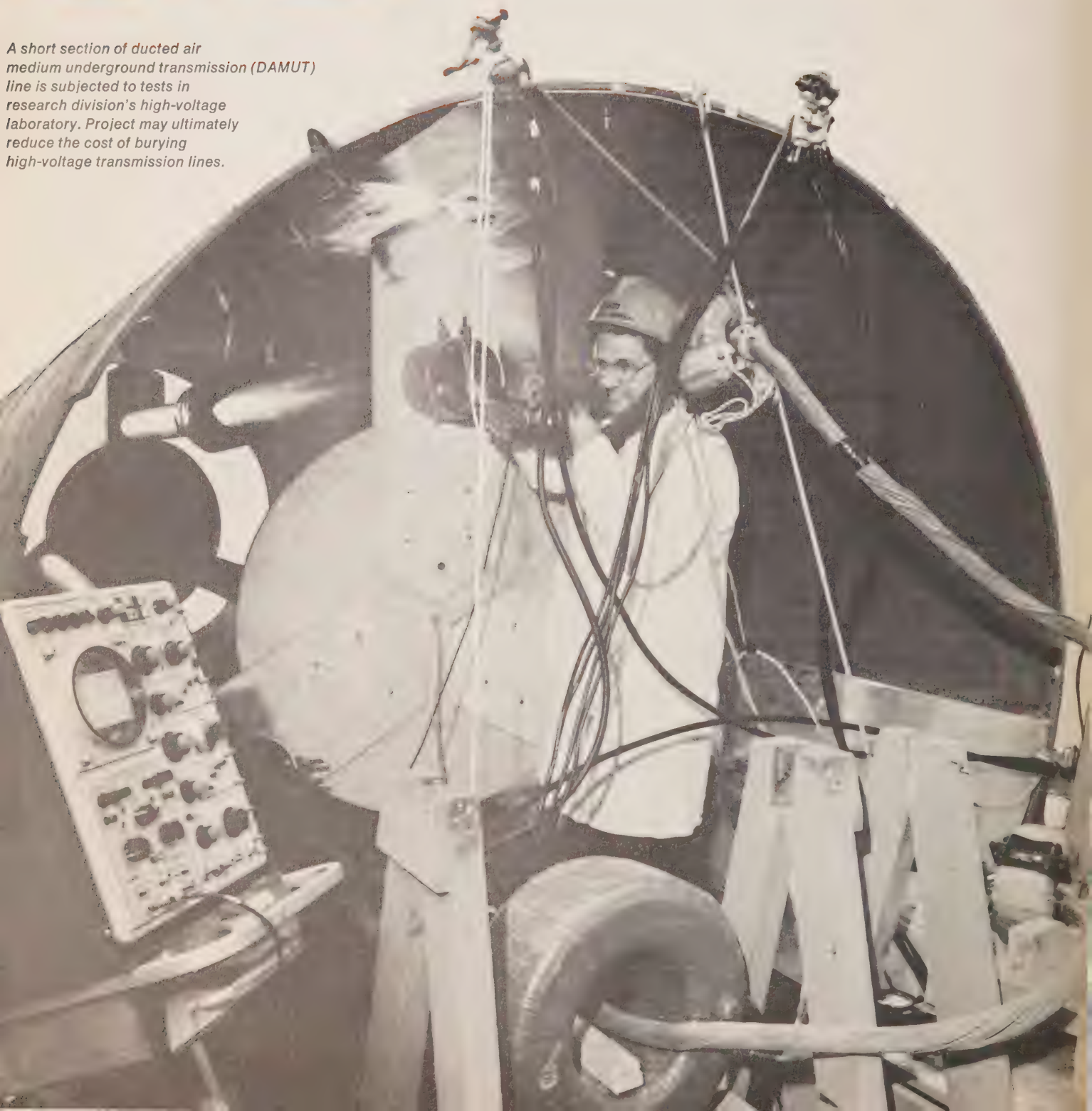




Guessing the number of cables in this colorful exhibit was a challenge to the adults while, on the outside, children were occupied with a barrel of peanuts. Around the site, tunnelling machines and bucket trucks, rock crushing and street lighting equipment were among the displays.

60 years of research

by Bill Settatree



A short section of ducted air medium underground transmission (DAMUT) line is subjected to tests in research division's high-voltage laboratory. Project may ultimately reduce the cost of burying high-voltage transmission lines.

all began with tests of lamps and meters. Now studies at Ontario Hydro's
esearch division range from methods of underground high-voltage transmission
the removal of sulphur dioxide from flue gases.

ter five years of work, Ontario Hydro is developed a prototype scrubbing de-ce to remove sulphur dioxide from stack ses at coal-burning power stations.

If a scaled-up version of the prototype ts the go-ahead, it will be installed at keview generating station, just west Metropolitan Toronto. While capable of ndling only a fraction of Lakeview's ack gases, the installation could lead to ger scrubbers at this and other fossil-el stations.

The new scrubber stems from an inten-e research program that originated in Hydro laboratory and then moved on the testing of smaller prototypes at the arn and Lakeview generating stations. Doug Harrison, who heads the pollution atement activities of Hydro's research ision, feels the scrubber will provide a eful short-term solution to the SO_2 blem. "Obviously, we'll have to work ways of cleaning the coal before we n it," he says.

Such is one type of research under way the W. P. Dobson laboratories on ling Avenue in Etobicoke. Named for dro's first director of research, the late W. P. Dobson, the centre accommo-es a staff of 375 whose work involves re than 2,000 projects with an annual dget of $9 million.

While this is more than many electric ities spend on R and D, research direc-Jack Waghorne feels increased ex-ditures will be necessary to cope with nnological and social demands. He sees a continued expansion of the sion's role and plans are being dis-sed to expand the existing facilities.

Up to now, we've been using Atomic rgy of Canada Limited's radioactivity oratory at Sheridan Park," says Mr. ghorne. "But we have reached the e in our nuclear program where we t have a facility closer to home."

ent research into extra high voltage smission lines necessitated the build-of a major surge test laboratory at nburg, and further expansion to this ity is also planned.

r. Waghorne feels the problems facing the electric power industry are so great that a significant expansion in R and D is mandatory. "The manufacturers can't do it because of the high costs involved. Governments can, but this should be a last resort. I prefer to see the utilities doing research and development financed in the main by their customers, while at the same time working with manufacturers on specific projects."

Rather than duplicate work being done by other research organizations, the division's objectives call for the selection of areas of R and D not being adequately pursued elsewhere in the world. At the same time, employees keep abreast of the international scene by serving on such technical and scientific committees as the American Society for Testing and Materials, the International Electrotechnical Commission, the Conference Internationale des Grands Reseaux Electriques (CIGRE) and many more.

In addition, Hydro is co-operating with universities, consultants and other scientific organizations in R and D projects. Assistance in pollution and transmission work has been obtained through co-operative arrangements with Western, Waterloo, Toronto and York universities.

The SO_2 problem is a prime example of joint ventures with private industry. While research on the scrubber has been a specific Hydro project, the utility lent financial assistance to two studies in the United States for the removal of sulphur dioxide from flue gases. In 1969, Hydro joined with 15 U.S. electric utilities in backing a $6.75 million Babcock & Wilcox – Esso study aimed at developing an SO_2 removal system. In 1970, along with six major American utilities, Hydro agreed to participate in a pilot test of Consolidation Coal Company's removal system. The two-part pilot installation will cost an estimated $1.6 million of which Hydro is contributing $365,000.

Meanwhile, back at the lab, Mr. Harrison's group initially opted for a limestone injection process for SO_2 removal. The process appeared to have two advantages: it's inexpensive and limestone is available in large quantities in Southern Ontario. But injection of dry limestone into the boiler created a dust emission problem and the project team turned to a slurry of limestone and water to trap the pollutant.

Other research in connection with thermal-electric stations includes the problem of disposing of millions of tons of fly ash. Tests have shown that the product can be used in concrete and as a base for road construction.

About 500,000 tons of fly ash are produced each year by the burning of coal and this output will increase. Disposal in urban areas is costly and trucking and dumping operations sometimes have an undesirable effect.

Use of fly ash has long been an objective of research division, which is seeking outlets for the material, mainly in the construction field. Fly ash has potential as a partial replacement for cement or, after pelletizing, as a lightweight sintered aggregate. One of the difficulties is the variability in ash produced due to generating stations operating under different load conditions.

The future will result in other disposal problems. For example, removal of SO_2 from flue gases will create secondary products requiring disposal. Installation of the limestone SO_2 treatment system at major generating stations would yield as much sludge as the amount of fly ash currently being produced and research is already under way to deal with the problem.

Biological studies on the effects of warm water discharge from thermal-electric stations, research into underground high-voltage transmission and development work on improved overhead transmission lines are also high-priority items as research division grapples with new criteria set in part by a more demanding public.

"These things would have come anyway," says Mr. Waghorne. "But public pressure is hastening the process."

Mr. Waghorne displays understandable pride in the fact that Hydro has been a

model airplane aids stack investigations



Outside the W. P. Dobson laboratories, Doug Wenglewick demonstrates model airplane that will gather temperature profiles of the atmosphere while Mark Van Horne holds balloon used to measure wind conditions.

If you ever pass by a generating station and see a small orange airplane flying around the stack, don't be surprised. The aircraft, a radio-controlled model, is packed with scientific instruments for one of Hydro's research projects.

Power station chimneys are designed to disperse pollutants in the atmosphere. But researchers want to know more about wind and temperature conditions around the stack. They want to measure the amount of sulphur dioxide and particulates in the air and chart plume patterns.

Initially, the model airplane is being used to check temperature variations and inversion patterns. Later, it may replace helicopters in charting the plume.

Up to now, Hydro has employed balloons equipped with scientific instruments to record temperature conditions. However, difficulties were encountered last year with a large helium-filled kytoon (kite-balloon) at the proposed Wesleyville generating station site, east of Toronto.

The balloon broke its anchor line and came down in Lake Ontario. Two men who went to retrieve it by boat nearly drowned when their craft capsized. Apart from this near disaster, approvals for flights of the balloon were difficult to obtain from the Department of Transport.

Full-size, fixed wing aircraft cannot fly low or slow enough for the studies and helicopters are costly to operate, so Hydro researchers hit on the model airplane as an alternative. □

leader in electrical research on this continent for 60 years, and has done so without financial help from government. Other Canadian utilities are just now moving into serious R and D work. Hydro-Quebec for example, has established a multi-million-dollar research centre near Montreal.

The Canadian Electrical Association is also considering a research program of its own. Funds will come from members and a significant portion of the research may be contracted to Ontario Hydro. A similar setup exists in the U.S. where the recently formed Electric Power Research Institute plans to spend tens of millions of dollars on research.

Ontario Hydro's research program dates back to 1912 with tests of lamps and meters and street lighting systems. In 1913, research division moved into a specially-built laboratory on Strachan Avenue, Toronto. This followed a decision to test and inspect all goods purchased by Hydro to ensure good quality.

As the number of different electrical appliances on the market grew, the Hydro laboratories became the major testing facility in the country. The Ontario Hydro seal of approval became a recognized label of quality and was sought after by manufacturers.

Research division continued to test electrical appliances and equipment until 1940 when the Canadian Standards Association took over this responsibility, enabling Hydro researchers to concentrate their efforts on problems more directly related to the generation and transmission of electricity. The division continued to expand and in 1961 moved to its present building.

Over the years, developments have included projects ranging from a special grade of concrete for Hydro dams to chemical methods of brush control on rights-of-way. The latter item alone has saved millions of dollars in maintenance costs.

One early achievement was the sonic scope, which transmitted sound waves powerful enough to penetrate 60 feet of concrete. Used in the detection of faulty

Vacuum apparatus is used in gas chromatography analysis of nuclear fuel rods. Lab also conducts quality assurance tests on items ranging from herbicides and wood preservatives to building maintenance products.



oncrete, particularly in hydro dams, the levice was eventually patented and sold hroughout the world. Another Hydro in-ention was the linascope, which sends igh-frequency impulses along a trans-ission or distribution line. By measuring ne time for the outgoing and returning npulses, operators can pinpoint trouble ources accurately and have repair crews uickly on the job.

Testing of bulk purchase items such as teel towers, protective relays, insulating ils and other materials and equipment is lso an important facet of research divi-on's activities. The division investigates erformances and deficiencies, works out uying specifications and evaluates com-etitive products.

Engineers investigating such problems s the corrosion of underground cables nd the pitting or cavitation of turbine lades have come up with answers that ave pared maintenance costs.

Vibration dampers on transmission lines cut down noise were an early develop-ent which has now been adopted ound the world. More recently, Hydro searchers developed a torsional damper prevent conductors galloping or thrash-g around in wind and ice conditions. ontrol of this phenomenon will lead to ore compact transmission lines. Re-earcher Jack Cassan has been in charge the project.

Hydro holds a patent on an improved sulator and is working with Canadian rcelain Limited in further developmental rk. The company has agreed to fill dro's requirements and when the new ulators are sold to other utilities Hydro l be paid a royalty which will help to set the research costs.

Because of the insulator and conductor search, Hydro plans to uprate some 5-kv lines to 230 kv without requiring ditional land or tower heights. Reduc-n of rights-of-way requirements is ex-cted to ease future land acquisition blems.

Mr. Cassan's group has also been work-g with industry in the design and elopment of new-look towers intended to be more pleasing to the eye. An octa-gonal, fabricated steel pole embedded in concrete will replace the familiar lattice-work towers.

Another project team has been working on the problem of going underground with high-voltage lines.

In the search to find a practical and economical method of transmitting high voltages underground, two systems are getting special consideration. One in-volves the use of sulphur hexafluoride (SF_6) gas, which has extremely good insulating properties. The other system, a concept unique to Hydro, consists of three aluminum tube conductors in a large air-filled pipe.

Known as DAMUT, for ducted air me-dium underground transmission, the sys-tem may cost only three times as much as conventional overhead high-voltage trans-mission compared to 15 to 1 for present-day underground.

In addition, a short-length of SF_6 gas transmission line is being tested at Klein-burg. The first SF_6 insulated transmission station in Canada will be located in down-town Toronto with special switchgear that will materially reduce land requirements.

Research division also assisted in studies prior to the installation of a data acquisition computer system (DACS) at the Richview system control centre in Etobicoke. DACS involves the use of re-mote computer terminals which will feed data from major generating and transmis-sion facilities across the province to the centre. The data will be updated every two seconds and pertinent information will be displayed on cathode ray tubes.

But the DACS centre is nothing com-pared to what Hydro researchers envision for the future. One study now under way deals with talking control rooms. The idea is that control room operators could ab-sorb more information more rapidly if the system could talk to them. Consequently, the effectiveness of computer-generated voice messages in conjunction with conventional visual displays is being evaluated. □

new energy policy

June 7 was a day of decision in Ontario with far-reaching implications for Ontario Hydro and the municipal utilities.

Within a few hours, Premier William Davis took the following steps which captured headlines across the province:

– Introduced legislation setting up Ontario Hydro as a corporation, creating a ministry of energy and designating a strengthened Ontario Energy Board to review electricity rates.

– Approved in principle a nuclear-intensive program by Ontario Hydro which will add about 8,000 megawatts in new generating facilities by 1982 and expand heavy water production facilities.

– Presented a 63-page report by W. Darcy McKeough, parliamentary assistant to the premier on energy matters, which stressed the need for conservation and efficient use of energy. "These proposals will form the basis for a new Ontario energy policy," said Mr. Davis.

– Released the fourth report of Task Force Hydro which deals with the sensitive areas of financial policy and rates.

One of the key pieces of legislation is an amendment to the Power Commission Act, which provides for setting up Ontario Hydro as a corporation as proposed by Task Force Hydro. The new corporation will have a board of directors consisting of a chairman, a vice-chairman, a president and no more than 10 other members.

The legislation also provides for retention of the provincial government guarantee of Ontario Hydro bonds as proposed in Task Force Hydro's fourth report.

In this special report, Hydro News carries details of these developments and items of particular interest to the municipal electric utilities.

hydro plans $3.5 billion expansion program

Premier William Davis has given the green light to a $3.5 billion-plus plan to expand Ontario Hydro's generating facilities.

The nuclear-intensive program will add about 8,000 megawatts to the provincial system by 1982 and an additional 2,200 mw of nuclear-electric capacity by the mid-1980's.

The program includes the duplication of the 2,160-mw Pickering and the 3,000-mw Bruce nuclear power stations, construction of a 2,000-mw oil-fired plant at Wesleyville, near Port Hope, and provision of additional power for Northwestern Ontario by 1978.

Preparatory work is also planned for a new nuclear station at Bowmanville with four 750-mw units. The first unit will be required for service in 1982.

To ensure adequate supplies of heavy water for its nuclear plants, Hydro plans to buy the 800-ton-a-year Bruce plant from AECL and to build a second plant of similar capacity at this Lake Huron site. And Hydro will continue efforts to ensure construction of additional heavy water capacity of 1,600 tons a year for Canadian needs.

Hydro will purchase the adjacent Inverhuron Park to permit expansion of the Bruce nuclear installations and the associated green belt. An agreement has also been reached to join with the Ministry of Natural Resources in acquiring about 1,800 acres for a new public park at MacGregor Point, 10 miles north of Inverhuron.

By 1978, Northwestern Ontario will require additional power supplies which will be provided either by arranging to buy power from Manitoba or by adding new units of about 100 or 150 mw to the existing coal-fired Thunder Bay plant.

The proposed Hydro program for 1977-1982, which was released simultaneously with the McKeough report on energy policy, is described in a 15-page statement prepared by the engineering and finance branches.

"The need for the commitment of all these items is urgent," says the statement, which sets out dates by which key government approvals and community consent



Premier Davis

will be required for the projects. The dates range between Sept. 1, 1973, for the Wesleyville plant and Dec. 31, 1974, for the nuclear station at Bowmanville.

In his statement to the Legislature, Premier Davis said it is the government's intention that such programs be reviewed by the Ontario Energy Board in conjunction with applications for rate changes.

"As a consequence, the government has decided not to hold up vital decisions which must be made now if we are to ensure continuity of supply in the future by waiting for the necessary review machinery."

The premier said the government was giving approval in principle to the program, subject to individual project approval procedures, so Ontario Hydro can proceed with detailed planning.

The Ontario Energy Board will review the program and use it as a basis for evaluating Hydro rates.

The Hydro statement said that although "major uncertainties" exist in forecasting load growth, power demands were expected to increase about 7 per cent a year to 1982, close to the long-term pattern. Of this, about 2 per cent could be attributed to population growth and 5 per cent due to increased use. Beyond 1982, however, declines were possible in both areas.

Stressing the need to maintain the current high level of reliability, the report recommended that reserve generating capacity should be maintained at about 20 per cent of expected power demands. This margin is comparable to the reserve generation targets planned by U.S. utility systems.

Hydro said the proposals for expansion pose significant financial problems" arising from inflationary and other pressures on fuel and operating costs along with the shift toward capital-intensive nuclear power plants.

Proposed changes in financial policies will maintain Ontario Hydro's debt-to-equity ratio at close to present levels, which will help to maintain the organization's financial integrity and minimize the impact on the cost of power over the long term, says the report.

The changes will also help maintain Ontario Hydro's favorable position in the Canadian bond market.

The revised policies would make maximum use of all possible sources of funds, including additional use of short-term and foreign bond markets, the significant drawdown of existing financial reserves and added charges to the cost of power to help pay for system expansion.

The report said that the added charges to the cost of power and the reduction of financial reserves will provide 10 per cent of the total estimated construction expenditure to the end of 1977.

As a result, the wholesale cost of power is expected to increase about 9 per cent annually for the next few years.

Discussing the financial implications of the heavy water expansion program, the report suggests that some form of financing, other than direct obligations of Ontario Hydro and its customers, be sought for two-thirds of the proposed additional capacity.

Hydro plans to finance the purchase of the existing Bruce plant over a number of years with a uniform annual charge. Construction of a second plant will cost an estimated $282 million between 1974 and 1978.

The additional 1,600 tons of capacity would require a further $581 million outlay between 1974 and 1979. Hydro says this extra financial burden might weaken its credit rating and push up the cost of power even more than projected.

Hydro has also agreed to co-operate fully with the Ministry of the Environment in studying the feasibility of burning garbage at its fossil-fuelled generating stations.

McKeough stresses conservation

"In a period of rapidly rising costs and incipient short supplies of energy, Ontario . . . must now be as preoccupied with efficiency of use and moderation in demand as it is in enhancing the supply of energy."

These words sum up the thrust of Darcy McKeough's report on energy, which contains 46 specific proposals. Premier William Davis said the proposals will form the basis for a new Ontario energy policy.

"Certainly, policy should be bent in the direction of restraining energy consumption with the objective of being below the consumption projected by the Advisory Committee (on Energy)," said Mr. McKeough.

Some of Mr. McKeough's key proposals are in line with Task Force Hydro recommendations and with the two-volume ACE report which resulted from an intensive study of the energy field.

Other proposals, if implemented, would mean a sharp departure from present Hydro practices in obtaining fuel for thermal-electric stations. Mr. McKeough said Hydro should be encouraged to consider investments in oil pipelines, other methods of energy transport and energy reserves both within and beyond the provincial boundaries – including exploration for and production of natural gas. Hydro should also take whatever steps are necessary to secure long-term supplies of uranium and heavy water, which "must be considered central to a policy of security of supply of energy for the province."

Mr. McKeough also suggested that the government and Ontario Hydro give "formal and careful consideration" to a proposal to construct a nuclear power plant in Canada for the purpose of exporting electricity to the U.S.

The report analyzes the uncertain world energy supply picture, particularly in relation to oil, and presses for a national energy policy.

Mr. McKeough said Canada is nearly in balance in terms of energy produced and consumed. "Theoretically, with national leadership, we should be able to protect ourselves from world crises related to



Mr. McKeough

energy and heat our homes and power our industry without being caught in the upward spiral of world petroleum prices. We can do so without prejudicing the reasonable aspirations of the other producing provinces . . ."

Mr. McKeough said conservation of energy was needed as well as increased research and exploration. "I cannot stress too strongly that I believe that we are going to have to use our existing energy more carefully and that efficiency in the use of energy must be encouraged and rewarded. We need a strong commitment and total effort."

Mr. McKeough proposed formation of an energy secretariat reporting to the Provincial Secretary for Resources Development. However, Premier Davis told the Legislature that the "critical importance of energy to the life of this province would best be served by the establishment of a new ministry."

Mr. McKeough said both Hydro and the strengthened Ontario Energy Board, which would expand to review both electricity and gas rates, should report to the Provincial Secretary for Resources Development.

The government's goals should be broadened to assure adequacy of energy supplies at "reasonable prices", to encourage efficient use of energy that will not adversely affect the environment, health or life and to provide leadership in assuring moderation in consumption of energy. "The era of cheap energy has ended," he declared.

Calling on the government to set up an energy development fund, Mr. McKeough said Ontario must be prepared to play a role in research, exploration and development projects in connection with potential energy resources in the Northwest Territories and all provinces.

"Our funds and resources are limited and must be used selectively," he said. But the province should monitor such things as coal gasification; development of techniques to exploit heavy crude oil deposits at Cold Lake, Alberta, and the Athabaska tar sands; oil-coal slurry pipelines; unit train development, air transport of crude oil and gas, and improved electrical transmission.

Thirteen of Mr. McKeough's proposals deal with conservation and efficient use of energy. They include increased use of public transit, moving more goods by rail, higher insulation standards in homes and public buildings, year-round daylight saving time and double DST in summer, and linking auto licence fees to gasoline consumption.

Other proposals:

– "Builder promotions" to induce customers to use certain types of energy should be ended by Ontario Hydro and private firms should also be asked to halt such practices. "If price is to be an influence in the direction of assuring efficiency in energy use, there is clearly no place for distortions that result from incentive programs," Mr. McKeough said.

– "The public should be encouraged to practice thrift in the use of energy-consuming devices. As a first step, such thrift should be insisted upon in all operations under the direct or indirect control of the government."

– The government should institute a program to reduce "any unnecessary and wasteful use" in its own buildings and areas under its control and encourage building owners, corporations and private citizens to do the same.

– The government should involve itself in research into efficient energy use in connection with thermal-electric plant cooling water discharges and home heating. "A concerted campaign to make the public increasingly conscious of the inefficient energy consumption of larger (automobile) motors and appliances and the like should be undertaken."

– Hydro and "regulated utilities" should be directed and all private companies requested to "avoid promotional practices or advertising which tend to encourage the use of energy."

– Ontario Hydro should ensure that advertising by municipal utilities is compatible with government energy policy.

– Efforts should be made "to modify pricing structures of all energy forms" so that efficiency in the use of energy is encouraged and rewarded.

Mr. McKeough indicated, however, that "there are limits" as far as energy conservation is concerned. "This politician cannot seriously recommend actions which might be taken to deal with, for instance, the kitchen stove pilot light or the 'instant-on' TV set," he said.

Discussing "reasonable prices" for energy, Mr. McKeough said there was a clear need for public participation in setting Hydro rates. He suggested price reviews for petroleum and, if necessary, energy price controls for all types of energy to protect Canadian consumers.

On natural gas pricing, he said the Ontario Energy Board should consider whether natural gas should be continued as a fuel for the Hearn generating station.

To protect the environment, all proposed energy projects, including transmission line corridors, should be assessed by a government agency, he said.

Turning to the national field, Mr. McKeough urged limits on exports of Canadian energy resources of all types until long-term supplies for Canada are assured; federal-provincial co-operation in policy-making; re-examination of the present national oil policy and a more comprehensive national power grid.

"The problem of a secure supply of clean energy is many-faceted," said Mr. McKeough. "Compromises are going to be made and it will be vitally important, unfortunate tensions are to be avoided that the public be kept fully informed as to the developing problems and proposed solutions."

start made on new utility structure

An executive committee has been formed to develop principles and guidelines for reshaping municipal utilities in existing or proposed regional government areas.

Premier Davis told the Legislature on June 7 that the committee will complete its work by fall when detailed technical studies and restructuring at the local level can get under way.

The membership and terms of reference of the committee, called the "Executive Committee for the Restructuring of Public Utilities," were not available at press time.

Mr. Davis recalled that earlier this year he stated that "each local circumstance would be evaluated to determine the appropriate tier of regional government to which a local electrical commission should relate."

The premier said the government was committed to local involvement in the individual studies, which will begin as soon as the overall guidelines have been established. He said he hoped that similar studies now in progress can be integrated into the province-wide study.

Legislation has been introduced to form three regional governments in the Hamilton-Wentworth, Halton and Peel areas west of Metro Toronto and in Durham Region, which extends east of Metro to Newcastle and north to Beaverton.

phase out special rates, says TFH

Task Force Hydro believes special all-electric and water heating rates should be phased out as quickly as possible except where they are subject to controlled disconnections.

This is one of the 28 recommendations in the Task Force's fourth report, which deals with the bread-and-butter issues of financial policy and rates.

No explanation of "controlled disconnections" is given in the report, but water heaters can be regulated by cut-offs during peak load periods.

The task force also recommended an independent electricity rate review board be set up, but Premier Davis has designated a strengthened Ontario Energy Board to carry out this function.

The task force said a review board should hear appeals and review proposals for changes in wholesale and direct industrial rates and review the principles underlying retail rates.

Premier Davis did not comment on the other 27 recommendations, but commended the report to the attention of the Legislature.

All special rates based on stipulated appliance ownership, such as electric heating units and water heaters, should be phased out, says the task force. "In our view, such rate practices constitute unjust rate discrimination."

Water heating rate changes would have to be introduced gradually because of the importance of this load to municipal utilities, says the report. It points out that water heating receipts account for almost one-third of the revenues of municipal utilities, and that rental and time-payment units represent a capital investment of $60 million.

In fairness to electric utilities, special natural gas rates related to appliances should also be "most carefully reviewed by the regulatory authorities."

The report says that the all-electric rate is not cost-justified and involves price discrimination.

Discussing special deals to induce builders to construct all-electric homes or apartments, the report recommends that means should be sought to eliminate such practices from the entire energy industry.

"From the standpoint of energy suppliers, builder promotions are a zero-sum game; the developers are the only obvious beneficiaries," says the report. Hydro should discontinue such promotions provided the oil and gas companies do so, too.

The report urges Hydro to adopt a pricing policy that will more accurately reflect the supply cost of electricity, and that will give effect to government policies for the allocation of capital within the energy sector.

Hydro should study the "feasibility and acceptance" of bulk power and retail rates that vary with the time of day or the season of the year. For example, it may be desirable to experiment with lower rates for night-time use and higher rates during the winter months.

As well, Hydro should consider kilowatt demand charges based on a customer's load at the time of the monthly or seasonal system peak rather than on the customer's individual monthly peak.

The report cautions against giving false price signals to customers and states that electricity rates must reflect the social cost of supplying additional power to ensure optimal allocation of resources (money). "If consumers are to decide intelligently whether to consume more electricity, the price they have to pay should reflect the cost of supplying the additional amount."

Two other recommendations zero in on disparity in rates between municipal utilities and the financing of underground distribution systems.

The task force recommends that Hydro reduce the number of standard residential and general service rate schedules to about 15 each, from which municipal utilities would agree to choose to fulfill their revenue needs.

Retail rates should include the cost of a standard overhead system "with any additional cost for a higher-value underground system to be borne by the new customers."

Dealing with industrial rates, the report proposes that discounts reflecting savings in marketing and certain operating costs be granted to all large industrial customers and the cost of such discounts be spread throughout the Hydro system.

To reduce disparities between industries served directly by Ontario Hydro or by the municipal utilities, the task force proposes that rates and conditions of supply be made as uniform as possible for all industries above a 5,000-kilowatt load, whether served by Hydro directly or by other suppliers.

Generating reserve margins should be reviewed periodically and be established by agreement between the Ontario government and Hydro. Hydro should also continue its efforts to improve the in-service availability of generating equipment with a view to reducing reserve margins.

In a further effort to reduce generating reserves, the task force recommends that Hydro promote interruptible power contracts, which provide discounts to some industrial customers liable to power cutoffs when supplies are short. A number of industries in the Niagara area now have such contracts.

steps to protect credit rating

Steps to protect Ontario Hydro's excellent credit rating are advocated in Task Force Hydro's report on financial policy and rates.

The fourth TFH report sets out guidelines and financial objectives for Hydro during the next two decades in view of its large expansion program.

A key recommendation is that Hydro take whatever steps are necessary to prevent any further increase in its debt/equity ratio.

The report points out that an organization's credit rating will begin to suffer when this ratio rises to a certain level and the cost of borrowed funds will begin to rise.

The task force measures Hydro's borrowing requirements against the total amount of domestic funds expected to be available for investment in Canada for all purposes.

Hydro's financing needs of the 1972-91 period will be substantially higher in relation to available savings than they were in the period 1951-71, says the report. It notes, however, that Hydro's share will be lower than the 2.4 per cent that prevailed during the period 1951-59.

To meet its future financial requirements, Hydro must obtain a share of available savings at least equal to the share obtained in 1970-71.

(A more recent Hydro estimate, made in the light of the 10-year proposed expansion plan announced June 7, indicates this percentage will rise to over 3 per cent by 1980 due to heavy capital demands.)

The report recommends that the mix of internal funds and external funds be established with the objectives of minimizing the cost of capital over the long term. (Internal funds come mainly from rates while external funds are raised primarily by long-term borrowing.)

Hydro should take the initiative with the provincial government in undertaking a periodic review of Hydro's financial performance, using rate of return on net assets as a principal criterion. The report says that Hydro's present rate of return is low in comparison with other utility systems, although it's on an upward trend

The report favors a position of finan cial independence and responsibility fo Hydro and foresees a continually growin need for capital. For these reasons recommends that surplus funds b retained by Hydro to be used at its discre tion for debt retirement, rate stabilizatio system expansion and to provide fo contingencies.

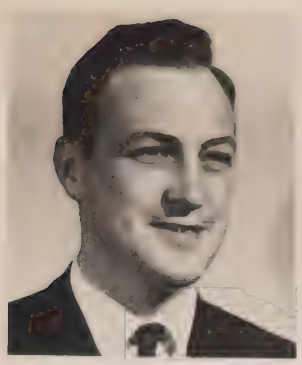
Another proposed change would signa a sharp departure from present powe costing practices. The report recommend that the current charge to the cost o power for debt retirement be replace by a charge sufficient to meet Hydro' requirements for internally-generate funds for both debt retirement and syste expansion.

The effect would be to reduce borrowin requirements by increasing rates. Th report cautions, however, that a carefu balance must be maintained betwee borrowed funds and those raised throug rates.

A general reserve fund would replac the present Reserve for Stabilization o Rates and Contingencies.

Turning to securities issues, the tas force favors retention of the provincia guarantee of Hydro's debentures but cal for more flexibility in financing. In particu lar, the report calls for Hydro to develop market for short-term debentures, cult vate the Canadian market for its securitie and continue to develop markets in cou tries like the U.S., Germany and Japan.

Over the long term, Hydro and th municipal utilities together should ado a financial policy that seeks to minimiz retail rates. There should be "appropria emphasis" on debt financing and using th rate of return on net assets as a princip criterion.



A. J. Bowker



D. M. Seath

The report criticizes the financial policies of municipal utilities, which have been mainly based on the "pay-as-you-go" principle, as being "very conservative". "Lower annual financing costs, and hence lower power rates, could have been achieved in many of the systems that have experienced continuous rapid rates of growth had such growth been financed to greater extent by debentures," it says.

Besides an appropriate amount of debt financing, the report urges utilities to seek financial independence and to develop an arm's-length relationship with (civic) government". Similar financial objectives and relationships with the provincial government are proposed for the Hydro corporation.

The task force proposes to discontinue paying a return on equity and, as recommended in the Role and Place report, to establish on Hydro's balance sheet an "accumulated equities" account. The new account would replace the current "equities accumulated through debt retirement" charges.

Under the plan, the annual charge to the wholesale cost of power for debt retirement and system expansion would be credited to this account. "The charges so credited . . . will be allocated each year to the participating municipalities and the rural power district in the same manner as the debt retirement charges have been apportioned in the past."

The report argues that the payment of a return on equity should be abandoned mainly in the interests of cost pooling and rate uniformity.

"The equity issue is not, in essence, a problem of power costing since charges (costs of return) and returns cancel out for all customer groups," says the report. "The major impact of the equity exchange is to contribute to variations in the cost of power to, and ultimately in the retail rates of the various supply authorities."

In addition, retail rate disparities arising from the equity exchange constitute a continuing public relations problem, says the report.

If the practice of paying a return on equity is phased out over a four-year period, the task force says the most seriously affected municipality would suffer an annual increase in its bulk power cost of $1.40 per kilowatt over the period, or less than 3 per cent a year.

The report also recommends that the practice of issuing 13th bills be discontinued. The bills currently provide a mechanism for adjusting differences between estimated and actual costs.

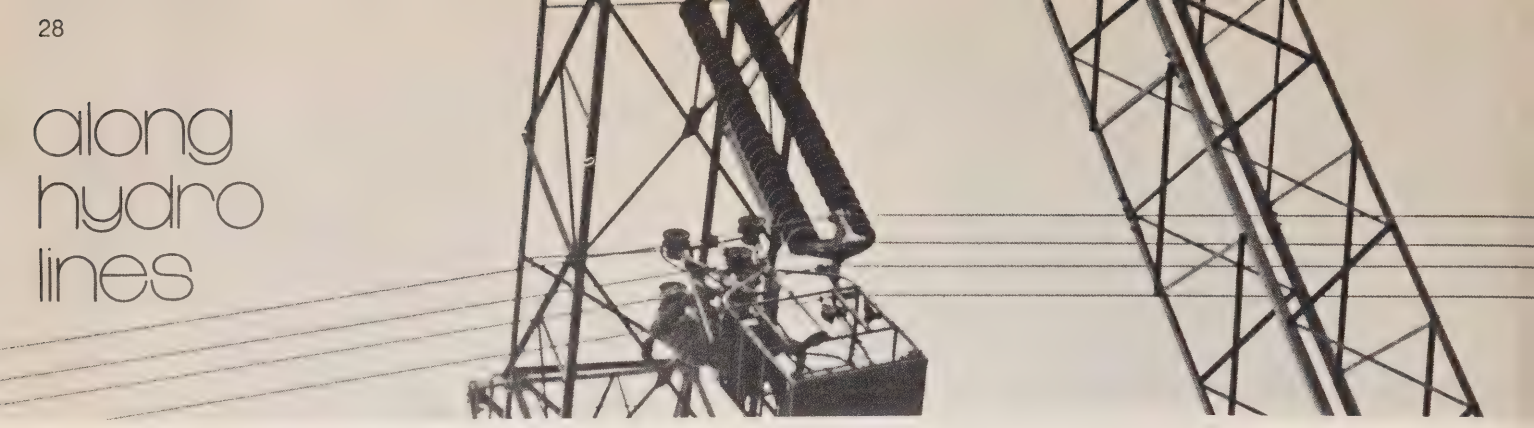
The task force says while it recognizes the important role that the 13th bill has played in the past – "as a symbol of the co-operation which has always existed between Hydro and the municipalities" – it feels the practice has ceased to be relevant and should be replaced by up-to-date accounting procedures.

The task force's 12-member advisory committee on financial policy and rates included A. J. Bowker, vice-chairman of the OMEA's power costing committee, and D. M. Seath, president of the AMEU.

Andrew Frame, of Burlington, past OMEA president, who is a member of the task force steering committee along with Hydro General Manager D. J. Gordon, dissented from three of the recommendations. These deal with use of surplus funds, charges to the cost of power for both system expansion and debt retirement, and discontinuation of 13th bills.

Now that the fourth report of Task Force Hydro has been issued, only the report on "make or buy" policy remains to be presented to the Legislature. Its recommendations are expected to be made public soon. □

along hydro lines



"Wise use" theme

"Wise and efficient use of electricity" will be the main theme of Ontario Hydro's future advertising campaigns. In addition, the 1973 advertising budget has been cut by more than a third.

The policy change was announced by Chairman George Gathercole in a letter to the province's municipal utility commissions.

Until the change, Hydro's advertising policy on residential marketing was geared to secure a more balanced use of generating and transmission facilities and greater production and distribution economies.

But Mr. Gathercole noted that in these times of inflation and mounting concern over the long-term adequacy of resources, "our residential marketing program has been increasingly interpreted as simply a means of promoting greater consumption.

"Ontario Hydro recognizes that everyone has a responsibility to husband our natural resources and with this premise in mind will encourage, through its advertising, the wise and efficient use of energy," Mr. Gathercole told the municipal utilities.

New trees for old

The stately elms are gone – the victims of Dutch elm disease – and the majestic maples are a decaying breed in the Meaford area, once rich in both species.

Many maples still stand in this town of 4,000 people situated on the shore of Georgian Bay. But the trees are in such an advanced state of decay that removal is inevitable. Now Meaford PUC has launched a major replanting program in which the utility is offering replacement trees free to any homeowner.

Dubbed "Tailored Tree Project" by manager Roy Bishop, the five-year program has a target of 1,500 replacement trees. Mr. Bishop expects 300 trees will be planted in each of the five years.

With the replanting program comes the need for some measure of control to ensure that replacement species won't interfere with sewers, drains, sidewalks or overhead lines. The expertise of Ontario Hydro's forestry department was drawn upon in choosing a species to meet these requirements while withstanding local climatic and soil conditions. In addition Meaford, which celebrates its centennial next year, was looking for a tree to symbolize the community's Golden Town image.



Trees for the asking

First choice was the sunburst locust – a fast growing tree with a maximum height of about 40 feet. The tips of the branches are a bright golden yellow – a natural for the town in which even the parking meter heads are painted gold.

Mr. Bishop says the leaves are so small that they do not create raking or removal problems.

Another species selected for street planting was the globular maple, a 20-foot tree. For back lot planting, the utility is offering shade master locust and Norway maples.

Backyard planting will be left to the homeowners, but street planting will be taken care of by the PUC staff and works department employees. "In that way we can control where the trees are located," Mr. Bishop points out.

The PUC expects the project will cost about $2,500 in the first year, but support is pouring in from all over town. The Chamber of Commerce has pledged financial assistance as has town council. The town works department has made men and a truck available for planting and local industry has offered money. One company has offered to provide all the wooden stakes needed to support the newly planted trees.

Bell Canada has turned over a large map showing every house in town. This is being used to pinpoint where trees have been planted and will aid the utility should it become necessary to canvass neighborhoods to persuade people to accept the free-tree offer.

Judging by the flood of correspondence pouring into the PUC office asking when the trees will be available, this is highly unlikely.

New job

The Solandt Commission, established by the Ontario government last year to look into the proposed route of a 500,000-volt Nanticoke to Pickering transmission line, has been given a new job.

Dr. O. M. Solandt, former head of the Science Council of Canada, will look into the routing of a 500,000-volt line between Lennox generating station, near Kingston and a new transformer station at Oshawa.

Particular attention will be given to social, environmental and economic factors involved in the building of the proposed line.

lew OEL manager

n engineer associated with the electrical ndustry for the past quarter-century, . D. (Bus) Guy, has been appointed anager of the Ontario Electrical League.



K.D. Guy

He succeeds W. L. Scott, who has been ppointed technical services engineer th Ontario Hydro's sales division.

Prior to his new appointment, Mr. Guy as in charge of Hydro's Cascade water eater, electrical modernization and pring into summer" air-conditioning rograms.

nviable record

kering generating station continues to the envy of the world's nuclear com- nity with the attainment of full power by t fourth 540,000-kilowatt unit in just 11 ys, 23 hours and 59 minutes after ctor start-up.

First power was produced only five days a three hours after start-up.

That schedule is far ahead of any other nuclear plant of comparable size in the world, and surpasses the schedules for Pickering's first three units. It was 13½ weeks from reactor start-up to full power for the first unit; 7½ weeks for the second and 2½ for the third.

Just as impressive as the commissioning procedures are the operating efficiencies of the plant's first three units. Latest figures show that Pickering was the world's top nuclear power producer in January with three units working at well over 90 per cent of capacity. In fact, units 1 and 3 performed at more than 99 per cent of capacity.

The percentages are ratios of actual production compared with perfect operation over any given time. An average capacity of 80 per cent is expected over the lifetime of a unit.

The fourth unit was expected to go into commercial service early in July.

Single system not enough

No single energy system is likely to satisfy all of Canada's needs, says Dr. G. N. Patterson, head of the Science Council of Canada's energy study working group. But, Dr. Patterson adds, the Canadian-designed CANDU reactor would come closest to being a national energy system.

"It's not likely in the immediate future that any one large style of energy conversion will take over the whole job," Dr. Patterson says.

He suggests this is because the Canadian energy picture is extremely regional. Some provinces will be able to depend on hydro-electric power for some time in the future. Ontario is already committed to thermal and nuclear power. Alberta has oil and gas.

Dr. Patterson says, however, that the CANDU reactor "can be built anywhere in Canada and can take over the load wherever needed. In a sense, that's a solution at the national level.

"A single energy system is not advisable anyway. Canada would be wise not to become too dependent upon one energy source. The failure to do this is one reason for the current U.S. energy crisis."

Dr. Patterson says Canada is not in an energy crisis and there should not be one. But by sitting next door to the U.S., "we are influenced by their condition. We must be careful we don't adopt a crisis complex in Canada and I don't think we need to."

The working group is studying several energy systems including nuclear power, hydro-electric power, solar and tidal energy and other forms. There are four constraints on its terms of reference: the energy systems must be environmentally acceptable; economically viable; socially acceptable, and take into account engineering problems and technological expertise in Canada.

"A system that benefits Canadian industry is the only sensible one we can look at. You don't do that by importing technology from a foreign country," Dr. Patterson says.

Build on success

Canada should be building on the success of its nuclear power program, says former Science Council of Canada chairman Dr. O. M. Solandt.

Speaking at a forum on energy resources at Montreal's McGill University, Dr. Solandt said Pickering nuclear power station is "the envy of the world. It's probably producing power as cheaply as any nuclear reactor in the world."

Dr. Solandt noted that the CANDU reactor can be adapted to use thorium instead of uranium as fuel. Thorium is more abundant and its use would extend the life of uranium supplies.

"We should be pressing ahead with work to introduce a thorium cycle," Dr. Solandt said.

Dr. Solandt suggested Canada should "get a foothold" in research into breeder

and fusion reactors as well, and that Atomic Energy of Canada Limited should go ahead with a project to study an organic-cooled CANDU reactor. He said Canada should not wait for the U.S. to do the research and development in these areas then import the technology.

"If the expertise were developed in Canada, there would be great international as well as local benefits," he added.

Plenty of parks

Hundreds of new parks may soon blossom across the landscape as the result of a scheme under which Ontario Hydro will make sections of rights-of-way suitable for park development available to municipalities at $1 a year.

Land will be leased for a specific period of up to 25 years.

Interest in the proposal is widespread with inquiries from all over the province, says Charles Tidy, Hydro's manager of properties. Smaller communities as well as the metropolitan areas appear eager to benefit from the proposal.

In the unlikely event Hydro will require the land, it will reimburse the municipality fully for its expenditures on the park.

Under the new policy, Hydro will ask no provision for relief of taxes or grants from the municipalities. It will need to maintain routine access to towers and provide anti-climbing barriers or any other safety features that may be necessary. These will be built by Hydro at its own expense.

Hydro Chairman George Gathercole says many rights-of-way are already being used for a variety of purposes in addition to transmitting power. "Several are used as part of golf courses, some as surface lines for subways at certain sections of their routes and some for bicycle paths and walkways. We're also considering setting aside some land for garden plots," he adds.

Garbage power

Lakeview generating station, on the western outskirts of Metropolitan Toronto, could be using garbage as a fuel in combination with coal if a provincial government study proves out.

Preliminary results of the study, announced in the Legislature by Environment Minister James Auld, were to be available by the end of June.

Representatives from Hydro, the Metro Toronto Works Department and the Ministry of the Environment made up the study team.

"When we examine the depletion of our fossil fuel resources, utilization of a significant percentage of refuse as fuel is probably the best thing that could be done in this day and age," Mr. Auld told the Legislature.

Members of the study team have toured Union Electric Power Corporation's Merrimac plant in St. Louis where pulverized garbage is consumed in a unit designed on a basis of 10 to 15 per cent garbage to 85 to 90 per cent pulverized coal.

About 16,000 tons of garbage have been burned at Merrimac to date, with the unit able to handle 300 tons a day. However, the system is still experimental and does not operate fully on a daily basis.

Lakeview has a capacity of 2,400,000 kilowatts. Its eight units consume a total of 824 tons of coal an hour at full load.

Another experimental plant, at Menlo Park in California, has generated power from domestic garbage. The $6 million unit is designed to consume 80 tons of garbage a day with an electricity "by-product" of 1,000 kilowatts.

Lakeview....to burn garbage?



tmospheric probe

ntario Hydro has launched a year-long udy into atmospheric conditions at ther- al generating station sites to "obtain ta to improve predictions of the havior of atmospheric emissions from keshore sites."

Acres Consulting Services Ltd., a Canad- n engineering firm, has been engaged carry out the study which has already gun around Hydro's Wesleyville site, ar Port Hope.

Much of the information gathered at esleyville will apply to other proposed ant locations along the shores of the eat Lakes, says W. G. Morison, Hydro's sistant director of generation projects.

All Ontario's fossil-fired stations, either erating or under construction, as well a prospective sites for future stations are cated on the shoreline of the Great kes or interconnecting rivers. The dis- rsion of flue gases is complicated by teorological conditions peculiar to se lakeshore sites.

Information from the Acres study will used to develop models to ensure that issions are within allowable limits der a variety of atmospheric conditions. e investigations will extend up to 15 les inland, 10 miles over water and to eight of 3,500 feet.

yth farewell

ere was standing room only in Blyth morial Hall when friends and col- egues turned out to pay tribute to liam Thuell, stepping down after 54 rs as superintendent of Blyth PUC. Thuell will continue to run his elec- al contracting firm.

mong the guests of honor were Huron Robert McKinley and Murray Gaunt, P for Huron-Bruce, who presented



William Thuell

Mr. Thuell with a scroll signed by Premier William Davis. Mr. McKinley said that when he first considered running for parliament, Mr. Thuell was one of the first people he consulted.

60 per cent nuclear

The U.S. Atomic Energy Commission predicts that nuclear power, now providing about 4 per cent of the country's electric energy, will account for 60 per cent by the end of the century.

The new forecast, entitled "Nuclear Power, 1973-2000," is the first AEC projection to go beyond 1985 and to consider the impact of fast breeder and high temperature gas-cooled reactors. The report says that about one-fourth of U.S. energy consumption is now electrical energy.

The forecast, which is based on conservative assumptions of population growth and energy consumption, says U.S. nuclear generating capacity will grow to 1,200,000,000 kilowatts by the end of the century – more than 80 times the present level of about 14,700,000 kilowatts. The total electrical generating capacity in the U.S. of all types was 402,000,000 kilowatts at the end of 1972.

Total nuclear capacity in other non-Communist countries is forecast to be 140,000,000 kilowatts by the end of 1980; 303,000,000 kilowatts by the end of 1985, and 1,460,000,000 kilowatts by the end of the century. The nuclear capacity in Communist countries, now about 2,500,000, is forecast to be 600,000,000 kilowatts by the year 2000.

The new foreign forecast, says the AEC, is slightly higher than last year's because of an increasing tendency to turn to nuclear power to satisfy energy needs.

Multi-meg fuel cells

The Edison Electric Institute and 10 U.S. electric utilities are working with the Pratt & Whitney aircraft division of United Aircraft Corp. in financing a long-range program to provide multi-megawatt fuel cells as power generators in existing utility systems.

Fuel cells, highly efficient devices for producing electricity electrochemically, have been under development at Pratt & Whitney in kilowatt sizes since the late 1950's. Several 10-megawatt units are now being tested by various utilities.

However, the new program envisages power plants with capacities up to several hundred megawatts.

Multi-megawatt fuel cell power plants dispersed at locations throughout a utility's electric power network would satisfy many environmental requirements. They emit almost no air pollutants, require no cooling or feedwater, operate quietly, and are comparatively inconspicuous.

Fuel cell power plants, says EEI, have higher efficiency over a full range of power loads than conventional generating stations and thus help to conserve fuel.

In many instances, the power plants could be installed on existing utility properties such as substations and would reduce the need for acquiring additional transmission line rights-of-way. Pre-

liminary design studies indicate that a power plant of the 20-megawatt size would occupy an area about 50 by 80 feet.

Through the use of modular elements, fuel cell power plants could be constructed in sizes tailored to the specific needs of the network. All common hydrocarbons, from natural gas to residual and crude oil as well as processed fuel derived from coal gasification, are potential sources of fuel.

Successful testing of a demonstrator power plant, say its supporters, would mean that production units could be made available to the electric utility industry in the late 1970's. Lead time for these installations would be considerably less than for conventional power stations.

Fuses made easy

Installing the wrong fuse in the home should soon become a thing of the past.

New glass-type screw-in fuses have been color-coded to indicate their rating: blue for 15 amperes, pink for 20 amps, red for 25 amps and green for 30 amps.

Each 15 and 20-amp fuse comes with a colored plastic washer which is inserted into the appropriate fuse socket. With the device in place, only the same color fuse will fit.

Fuses of higher amperage than 20 are color-coded for quick identification, but do not require rejector rings. The blue or pink rejector rings will automatically prevent use of a fuse in a circuit wired to take a lesser load.

Rejector rings will fit into existing standard fuse panels and the Canadian Electrical Code requires that new panels have the rejector rings installed.

Pipeline study

Interprovincial Pipe Line Co., of Toronto, is looking into the feasibility of transporting Alberta coal by pipeline to markets in Eastern Canada.

The coal would be pulverized and mixed with crude oil to form a slurry for delivery to electric utilities along the route. Ontario Hydro burns about 9 million tons of coal a year. The proposed 34-inch pipeline would have a capacity of 15 million tons a year.

The coal-oil slurry would be refined in the east where at least 75 per cent of the oil would be removed. The coal, mixed with the remainder of the oil, would then be burned in thermal-electric generating stations.

At present, Hydro buys its coal from Pennsylvania and West Virginia because Alberta coal delivered in Ontario would be 45 per cent more expensive. Interprovincial expects its scheme, which could be in operation by 1976, will be competitive with U.S. deliveries.

municipal briefs

Dunnville PUC almost sold its floral clock to the highest bidder, but a minor protest blocked the move. The timepiece didn't work and the utility felt replacing the rusted mechanism would be an expensive proposition. However, commissioners responded to public pressure and undertook the task of restoration while the town's horticultural society agreed to landscape the surrounding grounds.

Toronto Hydro has cautioned householders to demand identification from anyone claiming to be a representative of the utility and seeking to enter their homes. The utility says in local newspaper advertisements that all Toronto Hydro personnel and associated contractors must carry official identification. Toronto Hydro employees carry wallet-size identification cards with a color photograph. Water heater contractors wear a blue, white and gold badge on a round steel background.

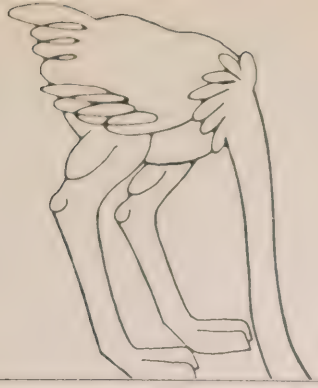
At least nine students in the Sudbury area can be assured of jobs this summer. Sudbury Hydro has agreed to hire that number as summer help. The customer service, plant and office departments will take on two students each, while the marketing, stores and engineering departments will each add one student to their summer staffs.

Dr. R. H. Hay, long-time member of Kingston PUC and chairman of the OMEA's power costing committee, was one of 13 prominent Kingstonians to receive an honorary degree from Queen' University at its annual convocation. Dr. Hay is a Queen's graduate both at the bachelor and masters degree levels.

The National Capital Commission will invest $5 million over the next 20 years as the federal government's share in a $15 million program to bury Hydro and telephone cables in downtown Ottawa and Hull, Urban Affairs Minister Ron Basford has announced. Mr. Basford says the NCC will pay its share of the cost in annual instalments of $250,000. Others contributing to the program include Bell Canada, Ottawa Hydro, Hydro-Quebec and the cities of Ottawa and Hull.

Oshawa PUC has appointed Ross Gibso a former news director at the local radio station, as supervisor of its new marketir and public relations department. Mr. Gibson has served both as an alderman and city controller.

Staff from the municipal utilities in Soutl western Ontario and representatives of the electrical manufacturing industry turned out in force recently to pay tribut to Ken Gerhard, supervising municipal accountant in Ontario Hydro's western region, who has retired after a quarter-century of service.



as don wright sees it

an we rightfully be accused of not seeing e people for the hairy-nosed wombat? nat seems to be the gist of an interesting aper written recently by an eminent nglish biologist suggesting that the balnce of nature is best left unbalanced. He notes that the genus Homo (that's s) first set foot in England about 250,000 ears ago. For scores of thousands of ears we skulked about with club at the ady and did nothing to disturb the balnce of nature except to gobble up a grub two and thump the daylights out of the w creatures who were small, slow and upid enough to be vulnerable.

But we did not tear up the earth for anting nor rip out any metals to fashion fols. We disturbed nothing and after a uarter of a million years the population southern England had soared to nearly 10 families!

Why? Because nature was balanced icely enough, but not exactly in favour of an. We tottered on the brink of extincon for thousands of years, this fellow aims, until we started pushing nature ound a bit and shaping it more closely t our requirements.

Spots remain in the world today where an hasn't been able to change very much d nature reigns supreme. One such area i said to be the Upper Volta in West frica, which is described as a land where ture remains in balance and where one i every five babies dies. Life expectancy i 35 years.

Our man of science is fed up with the ll of the ecologists for a new age in hich man will learn to live in harmony th the rest of nature. We tried that for 20,000 years, he says, but nature forgot t live with us. Some of its lesser creatres such as the rat, the locust, the flea ad the mosquito have not responded to bling and cooing with some pretty disarous effects on the human population. Ad he points to the Irish, who left their tato crop to nature in the 1840's with the nsequent death by starvation of a milin people when the spuds were wiped o by blight.

t's something to think about the next time we come down with a bad attack of back-to-nature syndrome. Sure we'd like to while away the days pirouetting in our long underwear among the daisies in some elfin glen. This is supposing no pesky tse tse fly finds a chink in our back flap. Then it's back to science on the double and the balance of nature be damned.

■ Not that we've anything against the birds and the bees – or the yellow-footed rock wallaby for that matter. He's among 26 species listed recently as being in danger of extinction and we must confess to something less than a nodding acquaintance with most of them. They include the quokka, the hairy-nosed wombat, the stick-nest rat and the freckled duck – all citizens of Australia. And unless things take a turn for the better, Americans will have to brace themselves against the imminent loss of the Okaloosa darter.

There is something awfully final about the death of a species, and even though we'd hardly notice the absence of, say, a plaint wandering desert bandicoot, its loss would give us a guilty feeling stemming back, perhaps, to the time when all we Homos were on the iffy list of whoever was keeping the score.

■ Some mighty queer solutions have emerged in the mad search for alternate sources of energy which has been underway since the Sheik of Araby left his harem and threatened to slap a chastity belt on a good part of the world's oil supply.

One of the more prosaic and unpopular proposals came from a member of our own legislature who suggested that long underwear was a good substitute for oil, gas and even electric heating.

A much more exotic approach has been the renewed interest in biomass. That's a polite word for the kind of stuff the lads with the long-handled dust pans sweep up after the horse guards have passed in regal procession down University Avenue.

The first international conference on biomass energy was held recently in Winnipeg at which it was allowed that the immediate prospects for chemically converting plant and animal wastes into energy on a mass scale were still a long way in the future. At the same time, if our scientists have at it in earnest, the thinking is, biomass will be a useful form of energy within 20 to 30 years. No thought appears to have been given as to what 30 years of wearing a clothes pin will do the scientific nose.

■ Statistics suggest that a good cow can produce 300 pounds of manure in a week. This works out to almost eight tons per year and if we multiply this by the number of cows in Ontario we end up with a helluva big pile of energy.

One enterprising Englishman has turned to the chicken to beat the energy crisis. A Devonshire poultryman, he puts the droppings (not eggs) from his flock through a digester where methane gas is generated by bacterial action. He's also devised a gas converter to feed the gas into the carburetor of his car and, voila – he's off to market in his 500 chicken-powered special.

Don't laugh. Methane is a much cleaner fuel than gasoline and also cheaper. Could be the day will come when eggs and legs will only be by-products of the poultry business.

■ Don't think the biomass boys are home-free with the conservationists just because they're trying to stretch out our resources with organic methods. Animals and birds have already been fingered as major sources of pollution and out Oregon way even the horses are wearing diapers.

A logger working on 400 acres of U.S. Forest Service land togged out his two teams of horses in underdrawers and claims the canvas snap-ons are 99 per cent effective. And still they're not happy. Portland's waterworks engineer says deer constitute a pollution problem "and they'd have diapers on, too, if we could catch them."

How's that for an eco-nut! Even if we did manage to fit out all of the four-legged folk with didees, who's going to change them? Elands and elephants in flush-a-bys are enough to boggle the mind.

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features

2 Bruce: another stage in Candu's evolution

Bruce generating station will benefit in terms of efficiency and reduced costs from design changes introduced as a result of the experience gained at the Douglas Point and Pickering nuclear plants.

7 New look at the heat pump

With the emphasis on energy conservation, the heat pump may well merit further development for indoor heating and cooling applications.

11 Megawheel men

Sweating over a hot turbine is all part of the job for the men who spend the summer months repairing and maintaining Hydro's large generating units.

15 Good omens at the CNA

Thirteen may be unlucky for some, but optimism reigned at the 13th annual meeting of the Canadian Nuclear Association as the international nuclear community focussed its attention on the success of the Candu reactor system.

18 Town of a hundred thousand horses

The 100,000-horsepower Arnprior generating station has a number of unusual features – not the least being its construction within the limits of this historic lumber town.

24 Utility conference covers a broad spectrum

Rates, energy use, the actions of environmental groups and marketing policies were among the subjects discussed at the annual conference of the Association of Municipal Electrical Utilities.

29 Along hydro lines

Les Dobson, Editor

Paul Page, Design Direction

Bill Boyd, Design

the cover

Concrete pouring continued night and day for a week during construction of the 15-storeys-high vacuum building at Bruce generating station. About 360 men worked 12-hour shifts on the non-stop operation. The vacuum building is a key feature of the nuclear plant's safety system. See article on Bruce – page 2.

Cover photo: Harry Wilson

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hydro news, volume 60, number 5

Published by Ontario Hydro, 620 University Ave., Toronto.

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Printed in Canada

VIEWPOINT

Why not go all the way?

Scarcely a month goes by without reinforcing the wisdom of those decisions taken some two decades ago setting this province and the country on the path toward nuclear-electric power via the unique Candu system.

Economics and technical feasibility were the big question marks in the early developmental stages and the vexatious problems encountered with the prototype Douglas Point station for a number of years gave Candu critics a field day.

Pickering's gold medal performance helped end that era and the station continues to set availability records unsurpassed by nuclear power installations anywhere. For base load operation, Pickering has already demonstrated that it can produce power at a lower cost to the customer than any alternative type of thermal generation available.

Other advantages put forward by the hard-pressed early advocates of Candu continue to gain validity while unforeseen factors are adding emphasis to their initial good judgment.

Extrapolating the demand for electricity, they realized how reliant this province would become on outside sources of fuel and they regarded our large resources of native uranium as an attractive alternative. This situation has since been spelled out very clearly in the recent studies assessing our position relative to future energy supplies and requirements.

Reinforcing the pro-nuclear argument are the rising costs of fossil fuels and the doubt being cast on their future availability as a source of power production.

Not a major consideration when the decision was made to proceed with the nuclear program, air pollution has since become a highly important factor in the choice of power plant fuels. Nuclear power is perhaps the least environmentally damaging of any practical method of producing electricity available to Ontario Hydro. And when the conservation of fossil fuels is added to the credit side of the ledger, the balance swings heavily in favor of the atom.

With all these advantages, why doesn't Hydro turn exclusively to nuclear power for all of its new developments?

Lead time was an over-riding factor in the recent decision to build a conventional thermal plant at Wesleyville. Nuclear stations require at least a year of additional lead time and it would have been impossible to bring in a new nuclear plant by 1979 when additional generating capacity will be required.

But there are several reasons why fossil-fuelled plants will continue to form a part of Hydro's construction program in the future. Present planning suggests that nuclear power will constitute about 45 per cent of total system capacity by 1992.

First and foremost is the heavy water situation. Supplies of this vital commodity are not expected to permit any greater nuclear commitment than this in the next two decades.

Another paramount consideration is the matter of experience. The performance at Pickering has so far been exemplary, but nuclear experience has been very limited in comparison with fossil-fuel technology and Hydro cannot afford to overcommit itself in any one direction.

And there are other factors to consider in charting the optimum mix of generation for the Hydro system.

Financing is one. Nuclear plants are much more expensive to build than fossil-fuel plants and while this is more than offset over the life of the plant by lower fuel costs, capital financing could be a problem on the scale Hydro will require in the future.

Operating characteristics also have a bearing on the kind of plant which may be deemed most suitable at any particular point in time. Candu stations operate most efficiently as base load plants while those burning fossil-fuels are more economical in meeting peak loads. Both kinds of generation are obviously needed and the amount of each depends upon the state of the system at any particular time. At present, the system has ample peaking capacity so that the bulk of the recently committed generation has been nuclear.

Nuclear power will take over more and more of the base load component of the generation mix – accounting for half of total system capacity sometime before the end of this century. And for this we can be thankful. It's a multiple blessing since this province has the uranium, the technological expertise and much of the manufacturing capability.

bruce:

another stage in candu's evolution



Bruce GS differs quite sharply in design from its nuclear forerunners, and many changes have been incorporated as a result of the experience gained at Douglas Point and Pickering.

A little over a decade ago, nuclear-electric energy appeared on the Canadian scene with the placing in service of the small Nuclear Power Demonstration plant at Rolphton, in the Ottawa Valley. Since then, the development of nuclear power in Ontario has exceeded the expectations of everyone but the wildest optimist.

Last December, the three Canadian-designed reactor units at the Pickering generating station, east of Toronto, produced 1 billion kilowatt-hours of electricity and the station had surpassed the output of any existing nuclear plant. On May 28, the fourth 540,000-kw unit achieved full power in record time, only 12 days after start-up, bringing the station up to its total capacity of 2,160,000 kilowatts.

Ontario Hydro and Atomic Energy of Canada Limited, once criticized for spending millions of dollars on an unproven system, are being lauded for the development of an efficient and reliable nuclear system. The concept of a natural uranium-fuelled, heavy water-moderated and cooled reactor is remarkable for both its ingenuity and flexibility. Not only that, it works.

Now Hydro engineers are concentrating their efforts on the Bruce generating station on the shores of Lake Huron. When completed, the first stage of Bruce will have a net capacity of 3,200 megawatts from four 800 megawatt units.

However, a $3.5 billion-plus expansion program announced earlier this year calls for the doubling of both the Bruce and Pickering plants and the construction of a 3,000-megawatt nuclear station at Bowmanville.

Bruce follows the trend established in recent years of building larger generating units at one location, thereby saving substantial sums in land acquisition and avoiding duplication of staff, equipment, buildings, and other facilities.

In addition to housing one of the world's largest nuclear stations, the 2,300-acre Lake Huron site includes a major heavy water processing plant, an auxiliary steam plant to provide process steam in the manufacture of deuterium, and the 200-megawatt Douglas Point plant, Canada's first commercial nuclear station. The heavy water plant is to be doubled and nearby Inverhuron park will be taken over by Hydro in the expansion. A new park will be developed nearby.

Bruce generating station differs quite sharply in design from its forerunners and many changes have been incorporated as a result of the experience gained at Douglas Point and Pickering. Most noticeable from an architectural standpoint is the absence of the familiar cylindrical reactor buildings.

Instead, the reactors will be housed in four rectangular buildings whose internal vaults will enclose only those systems and components which must be located inside the containment area. As a result, many heat exchangers, pumps and a variety of other mechanical equipment will be installed outside the vaults for easier checking and maintenance during full-power operation.

Operating experience at the smaller Douglas Point plant revealed leakage problems in the heavy water systems and modifications were introduced both there and at Pickering. A further step at Bruce – the segregation of the hot high-pressure heavy water systems from the high-pressure light water systems – should substantially eliminate the downgrading of heavy water by light water vapor.

In addition, a reduction in the number of boilers and pumps will help to minimize the chance of heavy water leaks. At Bruce, each unit will have only four heat transport pumps rather than 16 for the smaller units at Pickering. Each Bruce unit has only eight boilers against 12 per unit at Pickering.

by Bill Settatree

Looking at other changes in the evolutionary process of nuclear design, Douglas Point has two reactor vessels – the calandria and dump tank – housed in a massive concrete vault. Double rows of cooling pipes are embedded in the concrete. Inside the vault is a four-layered system of liners and steel plates to provide a heat shield, which along with a separate air-cooling system extended construction time considerably.

Modifications to this design were made for Pickering, bringing considerable savings. At Bruce, the design has been simplified even more by eliminating the dump tank and replacing the entire calandria vault structure with a simple water-filled shielding tank.

The integral end shields of the calandria are supported by and form part of the tank. They are filled with small steel balls, easily installed on-site, rather than the heavy steel slabs used at Pickering. The internal heat shields required at Pickering were not needed at Bruce.

Another change at the Bruce plant was the decision to install two pairs of fuelling machines for four units rather than one pair for each unit as at Pickering. The fuelling machines move automatically underground from one unit to the other.

Such modifications in design are expected to speed up construction and reduce costs.

Rapid shutdown of the reactor at Bruce is achieved by the use of shutoff rods. A second independent system is provided by injecting a moderator poison. Both methods stop the chain reaction by quickly soaking up the neutrons required to split atoms. Following a shutdown, booster rods (containing enriched uranium fuel) may be inserted into the reactor to permit start-up.

The reactors will be able to operate at varying power levels between 50 and 100 per cent of full power for extended periods of time to meet fluctuating system power demands, thus increasing their flexibility in the power system.

Bruce's 1,460-foot-long powerhouse will require more structural steel than the

A 650-ton reactor vessel, built and assembled at the Canadian Vickers plant in Montreal, arrives at Bruce generating station after an 800-mile Seaway trip

One of the most interesting constructi aspects at Bruce was the slip-forming "continuous pour" technique for erecting t concrete vacuum building. The around-t clock operation took about one we



Toronto Dominion Centre and by the time the job is completed in 1979 about 600,000 cubic yards of concrete will have been poured.

George Estey, manager of construction, says work is on schedule with about two-thirds of the concrete now in place. The service bay and unit 2 are already enclosed with mechanical and electrical work under way. Structural steelwork on unit 1 is progressing and by year-end the area will be enclosed. Structural steel will then be started for unit 3. The first unit is scheduled to produce initial power in 1975 with the other three units following at one-year intervals.

One significant construction feature was the slip-forming of the vacuum building or negative containment centre. The 24-hour-a-day operation took less than a week and minimized the number of construc joints in the building, which with the pr sure relief ducts act much like a g safety valve. Pressure in the vacu building is maintained close to a vacuum, allowing it to draw in any ra active materials in the event of an a dental release. About 12,000 yards concrete were required in the slip-form operation. The building is 149 feet

nd 161 feet across on the inside. The ircular wall is 3 ft. 9 in. thick.

A concept employed at Bruce is that of ffsite manufacture in which components or the nuclear reactor and steam supply ystems are provided in the largest, most anageable package.

For example, the 650-ton reactor vessels re being assembled at the Canadian ickers plant in Montreal complete with hield tank, end shields, calandria and alandria tubes, then shipped 800 miles to ne site by special barge over the St. awrence Seaway system. The reactor essels for units 1 and 2 have now been nstalled in their respective reactor build-ng vaults.

While surface work on the station is ontinuing at a rapid rate, crews from the oundation Company of Canada are work-ng underground on the water intake unnel that will eventually bring cooling ater into the station from Lake Huron at rate of 6,000 cubic feet a second. The ntake tunnel, being built at depths up to 40 feet below the lake bottom, will extend ,000 feet offshore. About 120,000 tons of ock and overburden will have been emoved by the time the tunnel is com-leted late this year.

Impressive though it is, Bruce gen-rating station is still only part of an inte-rated nuclear power development at the ake Huron site. Equally important to the anadian nuclear program is the $155 mil-on heavy water production plant, which ent into operation this year. Apart from emands from other nuclear plants across ne country, each of Bruce's reactors will equire 640 tons of heavy water.

The heavy water plant which is being urchased from AECL by Ontario Hydro, mploys a process based on the exchange f deuterium, a heavy form of hydrogen, etween water and hydrogen sulphide at ifferent temperatures.

Deuterium migrates to the water stream low temperatures and to the hydrogen ulphide gas at high temperatures. By a uitable arrangement of flow in separating owers, deuterium can be extracted from feed of ordinary water. In each tower, the water flows down through a series of perforated plates or trays, while the hydrogen sulphide bubbles up through the trays. This promotes efficient mixing.

The enriching section of the plant consists of three stages, the deuterium content of the water increasing as it passes from stage to stage. Finally, the enriched water is passed to a finishing section where it is distilled to a reactor grade product that is 99.75 per cent pure heavy water.

The plant requires 2,200,000 pounds of steam an hour and 128,000 gallons of water a minute for cooling and processing. Steam is provided by the original Douglas Point nuclear plant, with an oil-fired steam plant for back-up purposes.

An inventory of 1,400 tons of hydrogen sulphide gas is kept on hand for heavy water production – 1,200 tons in the enriching units with the remainder in bullet-shaped insulated storage tanks. These tanks have a special feature enabling them to suck back and hold the enriching tower gas in case of a leak.

H_2S gas acts basically as a transport agent. None is theoretically consumed in the production of heavy water, but losses do occur through the reaction with steel and impurities in the feedwater, small leaks and losses in process water and purge gases. Fortunately, H_2S is easily detected in air or water in concentrations as low as one part per million.

Because hydrogen sulphide is toxic, corrosive and flammable, it requires special handling. All equipment containing the gas is located in the open, avoiding the hazard of leaking gas accumulating in buildings. Gas monitors, connected to alarms, are located around the plant site and the enriching units are provided with a system of remotely-operated valves that can isolate any leaking portion of the plant and limit the amount of gas released.

When a leaking section is identified and isolated, remotely-operated dump valves can discharge the gas to a 425-foot-high flare tower where it will safely burn and disperse.

All H_2S areas are designated as "buddy zones" in which personnel must travel in pairs. Each man carries an emergency breathing pack and a strip of lead acetate-coated paper which changes color when a leak occurs. Sixty-four first-aid stations are located around the site where alarms can be sounded and assistance obtained in the event of an accident.

Since construction first started on the Douglas Point station in 1959, the surrounding communities have taken an interest in the nuclear program at Bruce. When construction of the larger station and the heavy water plant were subsequently announced, the move was acclaimed by the residents as "the greatest thing ever to hit Bruce." Millions of dollars are being plowed into the economy and the business community has been quick to provide many services.

When construction reaches its peak next year, an estimated 3,200 persons will be working on the site. The annual payroll is expected to exceed $30 million.

While many of the construction workers are housed on the site in camps, married people have acquired homes in the nearby communities. Port Elgin and Kincardine have seen the biggest increase in growth.

Statistics show that for each 100 workers on such an industrial project there will be 472 more people in the community and 149 more cars. The school system can expect 118 more students for each 110 workers.

The figures are being borne out today in Kincardine and Port Elgin. One school is already surrounded with eight portable classrooms and new buildings are under construction. Roads have been improved and sewer and water services expanded.

Recognizing its effect on the area, Hydro is paying $1,000,000 in grants over a 10-year period. This money is being shared by the various communities and the school systems.

The benefit to the surrounding communities is small, though, in comparison to the impact on the Canadian economy generally.

Virtually the only Canadian customer for many of the components going into

Construction workers leave the Bruce heavy water plant at the end of a shift. The 800-ton-a-year plant, now in production, will be doubled as part of Hydro's recently announced nuclear expansion program.



nuclear plants, Ontario Hydro has been indirectly responsible for the development in Canada of a large nuclear industry. In the past 15 years, an estimated $4 billion has been invested and 100,000 jobs created.

Among the big name companies are Canadian General Electric, Westinghouse Canada, Babcock & Wilcox, Canadian Vickers and Dominion Bridge, but there are literally dozens of smaller firms connected directly or indirectly with the nuclear program.

Canadian General Electric was the pioneering firm. Along with Ontario Hydro and Atomic Energy of Canada Limited it became involved in the 50's in a joint program to build the Nuclear Power Demonstration Station at Rolphton. CGE, a major contractor on components for Bruce and a nuclear fuel supplier, was the prime contractor on the CANDU reactor built in Pakistan. The company al operates a heavy water plant in No Scotia.

Westinghouse Canada has expanded operations to include a fabrication pla for nuclear fuel. Recently, the firm a nounced plans to establish a plant Cobourg, Ontario, to process zirconiu tubing for the nuclear fuel. Zirconium used as a sheathing for uranium oxide. fuel tubing now used in Canada is i ported from either the U.S. or Euro

Babcock & Wilcox, of Cambridge, h become a major manufacturer of stea generators for nuclear stations. Current the company's specially-built nucle "clean room" is the focus for the wo team assembling steam drums and he exchangers for the Bruce project. T clean room is pressurized with filtered to ensure that no dust will contaminate t nuclear components during fabrication.

Looking beyond the Bruce contract & W is working on conceptual desig for the next generation of nuclear co ponents. The company has also acqui additional land for plant expansion o the next few years.

In Montreal, Canadian Vickers found t nuclear industry a tremendous econor boost after Canada's ship-building indu try began to falter. The firm has played important role from the early stages nuclear power development and is a providing components for Candu pla abroad. The company erected a spec shop in its shipbuilding yards to han the reactors in the Bruce contract.

J. G. Matthew, manager of Hydro's s ply planning and resources developm department, says the list of companie virtually endless. At Bruce so far, 3, contracts worth $450 million have b awarded.

"Our job is to forewarn industry so c panies can prepare themselves to par pate in our programs," Mr. Matthew s "A major effort is necessary to ensure Canadian industry can get in and sta the nuclear program."

NEW LOOK AT THE HEAT PUMP

.ike the bridesmaid who never becomes the ›ride, this energy conservation device has ›een waiting at least 30 years for someone o lead it to the altar.

by Bob Morrow



The answer to a conservationist's prayer would be an inexpensive black box that required no fuel and reliably heated and cooled your house for little more than it costs to run a refrigerator.

Besides immense savings in fuel and electricity bills, such a device would conserve fuel and greatly reduce air pollution, particularly from a multitude of housetop chimneys.

The new product would be an instant hit. It's easy to visualize TV commercials proclaiming virtually free heating and air conditioning and imagine lineups three miles long to buy the energy-saving gadget.

In a stroke, the invention would cure a lot of headaches for electric utility systems faced with increasing expenditures for new stations and transmission lines.

In recent years, many ideas have been suggested to tap new sources of energy or to conserve existing sources. Unfortunately, no such cure-all device is on the market.

However, the possible contributions of residential and commercial heat pumps to make better use of energy deserve a hard look as an environmental option, particularly in combination with nuclear-electric power.

The residential heat pump may be less than the ideal energy conservation machine, but it does make more efficient use of electricity. More than 1,000 units have been installed during the past 10 years in Ontario homes, schools, shopping centres and office buildings.

Ironically, hardly anyone is rushing out to install heat pumps. Like a bridesmaid who never becomes a bride, the heat pump has been waiting at least 30 years for someone to lead it to the altar.

The Ontario Advisory Committee on Energy report points out that homes and commerce consume about 28 per cent of the total energy in Ontario, two-thirds of it

Commerce Court in downtown Toronto has four energy-saving heat pumps to reclaim internal heat and distribute it through the complex.

Electric heat pump installation at Lambto
Kent Composite School in Dresde

for space heating. About one per cent of total fuel use in the residential-commercial sector is for electric resistance heating.

"Obviously, application of technology to space-heating problems offers the greatest scope for affecting energy use in the residential-commercial sector," says the report, which mentions heat pumps among several energy-saving possibilities.

Other suggestions include improving the efficiency of conventional home furnaces, reducing heat losses by using better insulation, and introducing more efficient heat production, extraction and storage devices.

"The heat pump has potential," says the report, "but its future role will depend on further development."

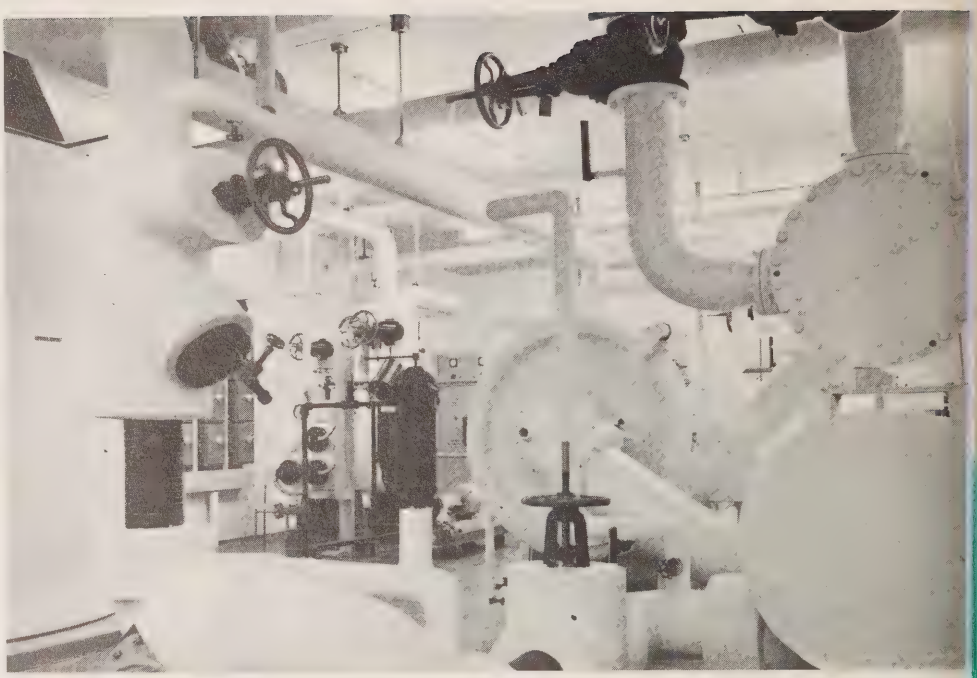
Ontario Hydro has delved into heat pumps several times in the past 25 years. Starting in 1948, experiments were conducted for several years in a transformer station and a bungalow, and in 1963 several types were installed for year-long testing in employees' homes. Now, due to changing circumstances, Hydro is taking a new look at the field.

One of the main attractions of the heat pump is its ability to extract heat from outside or indoor air and conserve kilowatt-hours used for electric heating and cooling. Engineers rate heat pumps by their coefficient of performance (COP), which is the ratio of total heat output to the energy input.

The COP for air-source heat pumps is always greater than 1. By comparison, direct electric heating installations, such as baseboard units or cable, have an equivalent COP of 1. At this level of efficiency, 1 kilowatt-hour of energy will produce an output of 3,412 BTUs of heat.

The COP for various heat pump applications usually runs between about 1.5 and 5, depending on the heat source, which may be earth, water or air.

This means that if you invest 1 BTU (the quantity of heat required to raise the temperature of a pound of water by one degree F), and get up to 5 BTUs in return, you have made a substantial gain in efficiency and in conservation of energy.



Thus with a COP of 5, an input of 1 kilowatt-hour would provide more than 17,000 BTUs.

Efficiencies in this range are achieved in large office buildings and shopping centres which recover heat from lights, people and equipment, and require air-conditioning. Residential heat pumps, which use outside air as a heat source, vary with temperatures between about 1.5 and 3. Supplementary heat is provided by electric resistance heaters.

Hydro's early experiments used warm water and earth as heat sources. An experimental heat pump installed in Toronto's Wiltshire transformer station in 1948, which extracted heat from transformer cooling water, at times achieved an efficiency of 6.4.

In 1949, Hydro installed an experiental heat pump in a Port Credit bungalow that derived most of its heat from the earth. A network of buried pipes filled with anti-freeze solution served as a ground coil.

The installation turned out to be too costly for general use, but it provided more than 80 per cent of the total heat supplied to the home for three winters together with adequate summer cooli Surprisingly, the insulation was much b low present electric-heating standards.

A custom-designed heat pump went ir operation in 1958 to heat and cool the s storey administration building at Hydr Robert H. Saunders generating stati two miles east of Cornwall. The u whose COP averages 4.5, derives h from water used to cool the powerhou generators.

Generally speaking, the colder the o door air, the lower the COP. As a resu more supplementary heat is required the temperature drops.

It is generally agreed that the growth residential heat-pump popularity has be retarded because some inadequately signed systems failed to provide effect performance.

Four different makes of heat pumps stalled in the homes of 10 Hydro e ployees in 1963 revealed a number problems. These included high installat costs, unacceptable noise levels, leaks refrigerant systems, and lack of exp enced servicemen and qualified insta tion contractors.

Some of these problems have since been reduced, but Ontario Hydro engineers believe there is still room for improvement in equipment. They stress that the main considerations should be good, reliable performance, long product life and customer satisfaction.

The experience of U.S. utility systems suggests every reason for caution. Southern utilities jumped on the heat-pump bandwagon in the 1950's and ran into the same problems later experienced by Hydro. Alabama Power Company, for example, had to provide servicing for faulty units at considerable expense to satisfy unhappy customers.

In recent years, the Alabama utility attacked these problems head-on by classifying heat pump models according to their performance records, by introducing an assured service program and by encouraging manufacturers to improve their products. Growing customer confidence has resulted in a 10.7 per cent annual growth rate.

About one-third of the homes served by the Tennessee Valley Authority are electrically heated, but only about five per cent use electric heat pumps. TVA estimates that a heat pump can save 7,000 kilowatt-hours annually in that region compared to other forms of electric heating and recently suggested in a utility publication that "this offers a major opportunity for more efficient use of electricity".

U.S. experience, however, shows that operating conditions vary widely between southern and northern states. The heat pump operates under greater stress when it is running during low (below 39) and high (above 93) ambient temperatures, and requires more maintenance.

how to pump heat uphill

Heat behaves like water; it runs downhill (from hot to cold) and leaks away as heat loss. A heat pump works uphill with the aid of a small electric motor that operates a pump or compressor.

During the heating cycle, the heat pump works like a refrigerator in reverse. It extracts heat from the outside air, even at below-zero temperatures, and pumps it into the house. During the cooling cycle, it removes heat from the house and pumps it outdoors.

The most common residential unit is an air-to-air heat pump that consists basically of indoor and outdoor radiator-like coils, fans and a pump. The outdoor coil contains a liquid refrigerant, usually freon, which picks up heat from the outside air and turns into a gas.

The pump compresses the vapor, raises its temperature and circulates it to the indoor coil. A fan circulates heat through the house air ducts.

It sounds like virtually "free heat" except for the relatively small amount of electricity required to run the pump and fans. Below 30 degrees, however, supplementary resistance-type electric heaters are needed in Ontario to maintain a comfortable temperature.

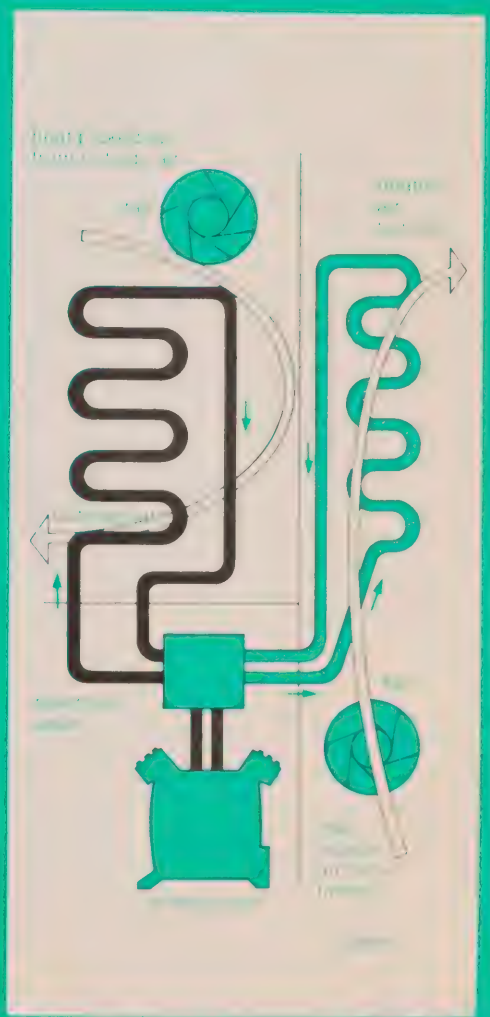
Still, there's savings in kilowatt-hours, even in the coldest months but particularly in the spring and fall when temperatures exceed 30 degrees. This helps to explain why many residential heat pumps are used in the southern United States where there is greater need for air-conditioning than heating.

Weather records show that while Toronto experiences temperatures as low as –10 degrees F. on certain days, the major proportion of the total heat hours in the year occurs at outdoor temperatures in the range of 20 to 30 degrees. At these temperatures, the heat pump will supply substantially more heat than conventional resistance electric heating at the same energy cost.

The overall annual saving in kilowatt-hours has been conservatively estimated at 20 to 30 per cent over a house heated solely with electric resistance units.

As a bonus, the heat pump system operates in reverse to cool the house in summer. Electric energy required for air-conditioning is only about 3 per cent of the total used by an all-electric home.

This combination of air-conditioning and heating helps to justify the high initial cost of the heat pump installation (about $2,000), a cost which is partly offset by lower operating costs. □



A heat pump in New Orleans, for instance, will operate under stress conditions for about 300 hours in a year. But in Chicago, because of the greater heating requirement, the same unit must operate under stress for seven times that number of hours.

Another climatic factor arises from defrosting, which is required most frequently between 25 and 35 degrees. A Chicago heat pump needs defrosting 1,400 hours a year, compared with 30 hours in Tampa, Fla. The amount of energy consumed in defrosting is small, about one-half of 1 per cent of the total used by the heat pump system, but dependability is vital to its operation.

The study that several Hydro engineers have been engaged in points out that residential units are complex equipment compared with conventional furnaces or electric baseboard heaters.

Requirements for successful installations include well-designed ductwork, an efficient and reliable heat pump system, a good warranty and parts replacement policy, as well as satisfactory servicing and annual maintenance.

To assess the present situation, Hydro engineers have recently completed a series of meetings with five major heat-pump manufacturers and two U.S. utility systems with extensive experience.

As well, magnetic tape recorders are being installed in 20 Niagara area homes equipped with heat pumps to study the load characteristics of each installation. The devices will register the average 15-minute demand for a 12- to 18-month period to find out the effect on municipal utility and power grid peaks.

In contrast with residential units, internal-source heat pumps used in large commercial or institutional buildings are well-established for certain heating and cooling applications. Sometimes called bootstrap heating, heat-conservation systems and heat-reclaim systems, they use energy expended in the form of heat within a building from such sources as lights, occupants, machinery and heat-producing equipment.

Such buildings require year-round air-conditioning (or summer cooling) in the central core and a combination of heating and cooling in the perimeter. The usual exchange medium is water-to-water so that heated or chilled water can be transferred within the building as required.

Excess heat can be stored in large water tanks for re-use while supplementary heat comes from an electric boiler or resistance heaters. For example, Ontario Hydro's new head office building will have a large heat pump installation along with a 1,500,000-gallon water storage tank.

During the past 10 years, a number of successful installations have been made in Ontario. In the Toronto area these include Thorncliffe shopping plaza, the former Telegram building, the Toronto Professional Building, the Toronto Star building and part of the new ManuLife Centre at Bay and Bloor.

Four heat pumps are used to reclaim internal heat and redistribute it through the new Commerce Court complex at Bay and Wellington, which has a daytime population of 16,000. All windows of the 57-storey central tower are double glazed with reflective glass to conserve energy. If needed, duct heaters cut in below 10 degrees F.

Besides fuel conservation, the big advantage is economy. The total connected heating load for the three new buildings in the complex is 7,425 kw, less than 15 per cent of the total connected load of 48,000 kw and less than the lighting load of 7,800 kw.

Custom-designed or package unit heat pumps are also being used in a number of schools in the province. Parkside Collegiate, in St. Thomas, has a 300-ton installation supplemented by an electric boiler, and several new Barrie area schools have package units.

But, assuming problems with domestic units are cleared up, what about the environmental effect of many heat pumps? The outlook is encouraging.

The comparative use of fossil-fuel resources for various house-heating systems including electric heat pumps has been studied by Hydro. Ontario Electric Leagu insulation standards for electricall heated homes, which have about 30 p cent lower heat losses than homes i sulated to National Building Code stan ards, were assumed.

Another factor taken into account w the future mix of hydro-electric, nucle and fossil-fuel generation in Ontario. Wi the advent of nuclear-electric power, t present fossil-fuel proportion of 45 p cent is not expected to be exceeded a by the end of the decade sulphur dioxi control systems are expected to be operation.

The heat pump wins out over fossil-fu home heat systems in fuel economy a proves to be the best bet in combinati with Hydro's future generating mix to r duce atmospheric emissions. If a he pump is used, fossil fuel emissions und the current generation mix are only percent of a domestic oil furnace meeti the same heating load. Tall power stati stacks instead of many roof-top chimne tip the balance further in favor of the he pump.

Maybe, if there's a will to conse energy, its day will soon arrive.

MEGAWHEEL MEN

While most people's thoughts turn to cottage and beach, the maintenance crews in Hydro's thermal stations sweat over a hot turbine.



v Rae Hopkins
noto Harry Wilson

Until it was taken apart for a major overhaul last spring, No. 1 unit at the coal-burning Lakeview generating station, on the western outskirts of Metropolitan Toronto, was limited in output for two winters to 260 megawatts. The 300-megawatt machine has been in service for a dozen years.

The 40-megawatt cutback, equivalent to the power demands of a city the size of Orillia, was ordered after an annual inspection revealed that six rows of blades in the turbine's intermediate pressure cylinder needed replacing. To continue to run at full capacity could have resulted in more serious damage. On the other hand replacement parts might take up to a year to obtain.

Unlike the family automobile, turbine generators are custom-made. "The manufacturer may even have to order the ingot before the steelmaker can provide the

material from which the blades are machined," says John Korzekwa, manager of Ontario Hydro's central thermal services.

The problem is compounded because many parts for large steam turbines have to be imported. "There just isn't enough work of this nature to warrant manufacturing complete large turbo-generators in Canada," Mr. Korzekwa adds.

Subjected to punishing temperatures and pressures, every one of the thermal units in the Hydro system is shut down for an annual check and overhaul. They must undergo a major overhaul every four years.

Annual overhauls involve a thorough inspection and possible repairs of auxiliary equipment. The unit is normally out of service about three weeks. But a major overhaul like the one performed at Lakeview earlier this year may take up to six weeks. It not only involves opening up the turbine cylinders, but the checking, repairing or replacing of anything from boiler feed pump recirculating valves to work on generator windings.

Basically, there are three types of outage – that's the engineer's way of saying out of service – which cause a generating unit to be shut down.

A forced outage occurs when a component failure or some other unexpected event requires the unit to be removed from service either immediately or within a few days.

A maintenance outage is the removal of a unit from service to perform work on specific components. This is maintenance done to prevent a potential forced outage, and which can be postponed for a short time.

The third category is the planned outage, or the removal of a unit from service for inspection and general overhaul. Such work is usually scheduled well in advance.

Every fall, says Mr. Korzekwa, station managers submit details of planned overhauls together with a brief description of the work to be carried out. Schedules are then drawn up in co-operation with the operations division, the group responsible for the smooth running of the provincial power network.

One of the most important considerations is to attempt to fit maintenance work into periods of low electrical demand. It's extremely difficult, for instance, to shut down a large thermal unit, which may account for one-thirtieth of the total available generating capacity, during the winter months.

Even so, some overhauls start as early as mid-February, immediately after the winter peak is passed, to ensure the work will be completed on all units by early November.

However, the bulk of turbine maintenance is carried out in June, July and August when demand is in the doldrums. Summer vacations must be carefully scheduled to guarantee that sufficient manpower will be on hand to cope with the workload. This leads to a lot of mutual give and take among maintenance crews so that someone who misses out one year gets his preferred dates the next.

"Of course, the trend toward winter vacations in the south has been a help, too," Mr. Korzekwa says.

Overhauls are carried out 16 hours a day to reduce down time. Finding replacement power can be costly, especially if it has to be produced by combustion-turbine units. In some cases, such as the reblading of a turbine, the work will continue around the clock.

Shutting down a machine for overhaul may take up to 36 hours, during which time the turbine is turned over slowly to ensure uniform cooling. The uneven heat distribution could result in warping of the turbine rotor if it were left stationary during the cooling-off period.

Lakeview 1 and 2 are cross-compound units each consisting of two side-by-side turbine sets driving two 150-megawatt generators, connected electrically to produce a total output of 300 megawatts. The remaining six units are of tandem-compound design in which the turbines and generator are coupled in a single line.

However, the maintenance problems are similar. About the only difference is the removal of more turbine covers from the cross-compound model than from th tandem-compound.

Even lifting the covers is a precisio operation. When all the bolts have bee removed four studs are installed, one a each corner of the cylinder, to keep th cover square until it is completely clear c the blades. As the overhead crane whic runs the length of the powerhouse raise the cover inch by inch, a careful check i made to ensure the cover rests exactl level in its sling.

With pressures in the turbine of 2,35 pounds per square inch and temperature of 1,000 degrees F, not only the blade come in for a thorough inspection. Valve bearings and couplings must all b checked, repaired, replaced or realigne Lifting the turbine spindle is also a pr cision job, performed with the aid of ste guides and a spirit level to avoid any fou ing of the turbine blades within th cylinder.

Once the spindle is completely clear the machine, it is moved on to a skid f the crews to work on it.

Tim Davies, an assistant mechanic maintenance supervisor at Lakeview, sa the blades are examined for damage, bo by visual and other means.

If the material under examination magnetic, a liquid containing iron filin may be sprayed on the surface. Iron pa ticles will follow the path of the fault a can be seen under ultraviolet light. A other common method of locating fau is the use of a penetrating dye.

Some cracks, Mr. Davies says, are minute they can be ground out. Othe may even necessitate the replacement a blade.

Work on the generator includes d mantling and examining the seals – hydr gen gas is used for cooling. Becau hydrogen and oxygen is a highly explosi mixture, extreme caution is taken ensure the generator is airtight.

Among other jobs, stator coils a thoroughly examined for signs of insu tion deterioration; dirt is removed fr air passages. High potential direct curr

continued on page

TURBINE MAKERS SINCE DAY ONE

Making turbine runners for some of the small older hydro-electric stations scattered around the country is almost like piecing together a stainless steel jigsaw puzzle. Most of the original manufacturers have been long out of business and the plans forgotten.

But solving problems of this nature is a way of life for the 14 skilled craftsmen at Barber Hydraulic Turbine Ltd., of Meaford, the only industry still in the smaller water-power turbine business in Canada.

Barber Hydraulic Turbine is an offshoot of the Charles Barber and Sons machine shop and foundry (it was later named Barber Turbine and Foundries) which opened for business on July 1, 1867 Confederation day. The late Charles Barber walked 20 miles from Owen Sound to set up shop in a red brick building with dirt floors on the banks of the Big Head River.

The company's archives contain numerous drawings and letters exchanged between its founder and such notables as Edison, Sir Wilfrid Laurier, W. L. Mackenzie King, and Vincent Massey.

A Toronto syndicate purchased the turbine segment of the business this year. It was renamed Barber Hydraulic Turbine Ltd. in February.

That renaming hopes general manager Harry McKay, will mark the rebirth of a century-old business. He suggests there are still a number of small potential hydro-electric sites and advocates their development as a means of assisting municipal utilities over peak periods, and as a partial solution to the energy crisis. In the meantime, the company is custom-making replacement parts and some new turbines.

Take, for example, Ontario Hydro's 4,000-kilowatt Kakabeka Falls station in Northwestern Ontario which went into service in 1906 and withstood the test of time until a couple of years ago when cavitation of the runner all but closed down the plant.

It now has a new lease on life operating on Barber replacement turbine runners. So has a unit at the 101,500-kilowatt Ontario Power plant at Niagara Falls, which started up a year before the Kakabeka station.



While the mode of transportation has changed considerably since Barber Hydraulic Turbine first opened for business on Confederation day, the company still produces wooden cogs and gears for old grist mills across the country

Barber's chief engineer, Bill Trick, says there were a large number of hydraulic turbine manufacturers in Canada in the early part of the century, but they're now out of business. In many cases when the manufacturers closed up shop, Barber acquired their technical catalogues and bought up technical drawings for retention in the company's archives.

This information, he points out, can usually assist in the production of replacement components.

"If we can't restore an old runner," Mr. Trick says, "we'll simply design and build a new one."

While new Barber runners incorporate modern technology such as stainless steel blades, mild steel crowns and updated welding techniques, the moulds are still produced from traditional wooden patterns.

And the company is still asked to provide replacement wooden cogs and keys for the old water-driven grinders in operating flour and grist mills.

Be they waterwheels of modern stainless steel design or even hardwood gears, Barber's replacements are expected to withstand the test of time just as well as the original parts.

continued from page 12

is applied to the stator windings in a non-destructive test to evaluate the condition of the insulation. Brushes and sometimes brush gear are replaced.

But the maintenance work doesn't end there. A unit overhaul also includes the boiler and its auxiliary equipment . . . even the coal-handling facilities. For example, the pulverizers that grind the coal to the consistency of talcum powder may require maintenance. Being a highly abrasive material, coal takes its toll on the boiler front and on the pipes it flows through.

Literally hundreds of other items from water control valves to pumps and fans have to be checked in the six-week overhaul.

The maintenance of hydro-electric units produces quite a different set of problems: the shaft of a hydraulic unit is vertical, and much heavier than a thermal unit's horizontal shaft; the hydraulic unit is a slow-moving machine compared to the high-speed steam turbine; and isolating the unit for repair is quite different. To stop a hydro-electric unit, plant operators simply drop the headgates and cut the flow of water.

Late last year, maintenance crews took Des Joachims No. 1, a 45-megawatt machine at the Ottawa River plant, out of service to replace the generator windings. The 23-year-old unit was shut down in December – unlike a thermal unit, some hydro-electric units can be shut down in winter when water levels are low.

An inspection of the Des Joachims unit's runner or turbine showed the need for a major welding job. It turned out to be a 3,500-pound weld, where steel had been eroded by the cavitation action of the water. An estimated 75 feet of cracks ran throughout the runner. Cracks 20 to 30 inches long, in some instances extending right through the blade, were discovered.

To eliminate them, holes the size of a workman's lunch bucket were gouged out and filled with welding material. A relatively new pulse-arc technique was used to weld the runner, which was then heat-treated to relieve stresses. Electric heat was applied and the temperature raised 50 degrees F an hour until it reached 1,150 degrees. Then the runner was cooled at the same rate.

Finally, the 50-ton runner was checked for distortion and ground down to its original shape.

Unlike the vastly more complicated thermal-electric generator, hydro-electric units – there are 261 of them in the system – undergo a major overhaul only once every 10 to 25 years.

"As a rule, it's easy to pinpoint the cause of a problem," says R. A. Wright, of Hydro's system maintenance division. "More often than not, it's just old age."

Shutting down a large nuclear unit for overhaul is in some ways similar to shutting down a conventional thermal unit, in that a great deal of the work to be carried out is on the turbine-generator.

However, in a nuclear unit, it's not usually necessary to do anything with the reactor core. Like the auxiliary equipment for fossil-fuel units, reactor components, such as pumps and valves, are often in need of repair or replacement.

Complicating the problem of overhauling a nuclear unit, says John Graham of Hydro's central nuclear services department, is the need to work in radiation fields. Shutdown plans must include such details as estimated doses of radiation for each maintenance job to ensure that station personnel do not exceed the prescribed limits.

Throughout the operation, personnel are required to wear protective clothing and subject themselves to stringent monitoring regulations.

Mr. Graham says that shutdown plans will often include a full-scale mock-up of the repair job to familiarize personnel with the work. This, he adds, often saves time when the actual task is carried out.

If the work is extensive, it may become necessary to bring in outside contractors as Hydro workers reach their maximum annual radiation counts and are transferred to unrestricted areas.

Another major consideration in working on nuclear equipment, says Mr. Graham, is heavy water conservation. At $60 a kilogram, that's understandable.

One of the main aims in the overhaul of a nuclear unit is to make the heat transport system as leak-tight as possible. While more than 90 per cent of the heavy water that does escape is collected, the substance is downgraded through contact with ordinary water vapor in the atmosphere.

A recently-developed technique of nuclear unit maintenance is in-service inspection of the heat transport system in which pipe welds are subjected to ultrasonic testing procedures.

Undoubtedly, the maintenance picture for both fossil-fuel and nuclear stations will be complicated by the trend toward larger thermal-electric units. The four turbine-generators being installed at the Bruce nuclear station, on Lake Huron, each have a capacity of 750 megawatts. That's equivalent to the loss of two-and-a-half Lakeview units whenever a Bruce generator has to be taken out of service.

Part of the answer will lie in increased power reserves, careful scheduling and efforts to achieve higher unit reliability. Hydro has witnessed steadily increasing unit sizes in the past two decades and its highly-trained maintenance crews can be expected to take 750 megawatts or even larger units in their stride.

GOOD OMENS ABOUND AT 13TH C.N.A. MEETING



Hydro Chairman George Gathercole, D. Darcy McKeough and CNA secretary-manager Jim Weller face TV cameras at press conference

A rosy outlook for Canada's nuclear industry was the major conclusion to be drawn from the 13th international conference of the Canadian Nuclear Association.

If any of the CNA program planners were superstitious, their fears were quickly allayed. The 13th meeting was one of the best attended and attracted delegates from a variety of countries including Italy, Korea, Japan, Britain, India and Pakistan. A delegation from the Soviet Union was expected, but for some undetermined reason never arrived.

Ontario Hydro Chairman George Gathercole was clearly enthusiastic when he officially opened the meeting. The operating success of the Pickering nuclear station was in large measure responsible for the worldwide interest in the conference. And the announcement a few days earlier that Hydro was embarking on a $3.5 billion-plus expansion program – most of it nuclear – added to the chairman's pride.

Mr. Gathercole said the future of nuclear power and the CANDU system has never appeared brighter. "When one looks at the tight international fuel supply situation today, with oil being used as a pawn in Middle East politics, we are reminded afresh of the wisdom in pressing ahead with the development of nuclear power and especially our heavy-water reactors fuelled with natural uranium.

"The years ahead will be exciting and full of promise and potential," he added. "We will have problems, too, but we have had them in the past and surmounted them. We are poised on the threshold of great opportunities. I am confident that this industry will now go ahead and make the most of its tremendous potential."

W. M. Gilchrist, president of Eldorado Nuclear and out-going president of the CNA, said Hydro's commitment to nuclear power will make it the largest nuclear utility in the world with 13,000 megawatts of nuclear capacity.

He warned, though, that the increased emphasis in nuclear power has created an important job for the CNA in acquainting citizens with the facts.

"As more plants are built across Canada, an informed public will undoubtedly participate in many of the discussions related to the introduction of nuclear energy to their regions. The greatest contribution the industry could make to public understanding is to speak frankly and to have complete answers to questions raised."

Mr. Gilchrist said there was a need for continued nuclear research in Canada



He also called on the mining industry to reassess its position in the light of future requirements for uranium ore.

Among Hydro participants at the conference were H. A. Smith, chief engineer, and Milan Nastich, assistant general manager-finance.

Mr. Smith discussed Hydro's progress to date in the nuclear field and outlined some of the thinking behind its nuclear program.

"Although we may have renewed confidence in the CANDU concept as a result of Pickering's performance, the risks and challenges are by no means at an end," cautioned the chief engineer. "In the next 10 years, to meet the expected demand for electrical energy in the province of Ontario, we will need to commit about four times as much nuclear capacity as has been committed in Canada to date, or about 20,000 mw at a cost of $10 billion."

Mr. Smith outlined some of the technical studies done in connection with Hydro's expansion program. They included a cost-reduction analysis of plants identical to Pickering and Bruce, a study of design improvements to Bruce leading to capital cost savings and improved reliability and maintenance, a preliminary engineering evaluation of a station with four 1,200 mw units and a study of the pros and cons of light water reactors.

Mr. Smith estimated that capital cost savings of about 10 per cent will be achieved by building identical plants to Pickering and Bruce. This is due mainly to a reduction in schedule of 10 months from approval of the station to the first unit going into service, a cut in total commissioning time and reductions in engineering and planning costs.

"Beyond the repeat of Pickering on t Pickering site and Bruce on the Bru site, our long-range program to the 199 is based upon a nuclear fraction of a proximately two-thirds of the capacity be added to the Hydro system," M Smith added.

"In the next 20 years, assuming lo conditions grow at the existing rate, 50,0 mw of nuclear plant will be committed Ontario. This may have to be increas substantially if solutions are not found the forecast shortage of suitable fos fuels and pump storage has to be used meet peak loads."

Mr. Smith said the program is expect to take advantage of a number of repe of Bruce-size units to minimize capi costs, avoid unnecessary prototype dev opment and maintain good reliabili "Following this, if we are successful in t



Keen interest in Canada's nuclear power program was clearly demonstrated by the overflow attendance at the 13th international conference of the Canadian Nuclear Association. Ontario Hydro's experience with the CANDU reactor was the focal point of discussions.

ext orderly extrapolation of 1,200-mw nit size, we envisage several plants tilizing repeats of these larger units. eyond this, 1,800-mw units may be onsidered."

Milan Nastich said Hydro's capital-ıtensive nuclear program will require bout $7 billion more in bond issues than high fossil-fuel program. He pointed out ıat in 1972 Ontario Hydro's demand on ıe capital markets was two per cent of ross national savings. By 1979, under a ıirly heavy nuclear program, this would ıcrease to 3.3 per cent.

"A capital-intensive nuclear program ould create an upward pressure on in-rest rates for utility borrowing," Mr. astich warned. "The effect of such pres-ures should be considered in the eco-omic evaluation of the program. Another ossible consequence is that continuing heavy capital requirements could lead to government rationing of the capital market."

However, Mr. Nastich emphasized that a concentrated nuclear program is Hydro's best course of action. And in the light of escalating fuel costs and increasing environmental regulations, the relative economics of the nuclear program look even more attractive.

A. B. Hocking, an official of the Toronto-Dominion Bank, noted that Ontario Hydro and Hydro-Quebec borrowed 75 per cent of all money loaned to Canadian electric utilities in 1972. He said there is bound to be difficulty in persuading investors to make funds available for huge projects in the future.

"Historically, electric generating systems have been built on the firm foundation of long-term debt with fixed annual carrying costs locked in for the life of the project. It may be that the major Hydro authorities in Canada will have to accept higher interest costs and, or, some form of variable interest rates in order to win a larger share of Canadian savings," he said.

Darcy McKeough, who since the conference has been appointed to head the new Ontario Ministry of Energy, suggested that exporting power from Canadian nuclear plants might be better for the economy than exporting the plants themselves.

He referred to a proposal by Acres Consulting Services Limited to build a 3,000-mw nuclear plant on the shore of Lake Superior to supply the U.S. market. He said such a plant would create more jobs than would be provided in selling plants overseas. □

TOWN OF A HUNDRED

Arnprior GS is located smack in town.
Thing is, its electrical output is just a fringe benefit



THOUSAND HORSES

by Rae Hopkins



he saws have almost been silenced in te town of Arnprior, which owes its existnce to the thriving lumber industry of te scenic Madawaska River Valley. In race of the sawmills has come an abunance of diversified secondary industry roducing everything from woollen blan-ts to penicillin and travel trailers.

But just outside this quaint town of 000, nestling at the confluence of the tawa and Madawaska rivers, the sound buzzsaws converting pine logs into essed lumber is as familiar today as it as in the 1800's.

From the standpoint of the hydraulic gineer, Arnprior has two peculiarities: ntario Hydro is tapping the power potenl of the Madawaska right in the centre town. And the 76,000 kilowatts – that's out 100,000 horsepower – Arnprior genating station will feed into the provincial d by 1976 is merely a fringe benefit. The main purpose of building at Arnor is to correct environmental problems associated with water-level fluctuations, bank erosion and turbidity along the lower Madawaska. These are believed to be brought about by the operation of hydro-electric plants further upstream, in particular the 153,000-kilowatt Stewartville station, eight miles to the southwest.

It was in 1971 that Hydro decided to build the Arnprior station, subject to three constraints. Firstly, geological conditions had to be satisfactory. Secondly, the project must be acceptable to regulating authorities and the Arnprior community. Thirdly, with the predicted improvement in environmental conditions along the lower Madawaska, operation of the upstream stations as peaking plants would continue. Peaking plants store water during the hours of low electrical consumption, releasing it through the turbines at times of high, or peak, demand.

Field investigations quickly showed the site was technically feasible. Agreement of the municipalities, which included the town of Arnprior and the townships of Pakenham, Fitzroy and McNab, was obtained and on June 6, 1972, government approval was announced in the Ontario Legislature.

Two days later, Hydro Chairman George Gathercole announced the intention to go ahead with the $54 million project and the appointment of Acres Consulting Services Ltd., a Canadian consulting engineering firm, to undertake design engineering, construction, and project management responsibilities.

The Arnprior project will involve the building of a 2,600-foot main dam that will rise about 80 feet above the Madawaska at its highest point, spanning the river and adjacent lowlands about two miles upstream from the Ottawa. The main dam will cut across an existing island in midstream, with the powerhouse located on the island's east side and the sluiceway on the west. The central portion will be built of concrete with concrete and earth

wing dams on either side.

Two 38,000-kilowatt units will be installed. They will be controlled remotely from Chenaux generating station, about 20 miles away on the Ottawa River. Creation of the headpond will form a 2,400-acre artificial lake extending 10 miles to the Stewartville tailrace. Approximately 1,880 acres will be flooded and 54 miles of new shoreline established. About 100 properties will be affected by the flooding, including 200 acres of cultivated land, 800 acres of pasture and 900 acres of timber land.

A second dam, a 4,000-foot long, 50-foot high earth structure, will be installed on the headpond's east shore at Waba Creek near Highway 29 to prevent water spilling over the watershed between the Madawaska and Mississippi river valleys.

Channel improvements will be made along the two-mile stretch between the main dam and Chats Lake, a wide section of the Ottawa where the two rivers meet. These will include replacing the 50-year-old town dam with a horseshoe-shaped control weir to maintain daily water-level fluctuations in the plant's tailrace to about two feet.

The old town dam is located under a narrow two-lane bridge on Highway 17, Arnprior's main thoroughfare. The bridge will be replaced with a four-lane span.

Consideration was first given to building a station at Arnprior in 1964 when Ontario Hydro started to redevelop the Madawaska for additional peaking power. Mountain Chute generating station was built and additional units were installed at the existing Barrett Chute and Stewartville plants. But the Arnprior project was shelved after studies showed it would be uneconomic at that time.

Since then, skyrocketing coal prices, more stringent anti-pollution regulations and other factors have greatly added to the cost of building and operating the equivalent thermal-electric capacity.

Baji Ghadiali, Hydro's field engineer at the project, says the building of a dam and power plant of such size within the municipal limits of a town has created some special problems. A community liaison committee has been set up to keep the town fathers, municipal officials and the public informed.



In addition, the Ontario government has set up a task force with representation from various ministries to look into the best uses of lands surrounding the new reservoir.

Arnprior's mayor, H. T. Cranston, says his council and the councils of the three affected townships "sincerely welcomed" the decision to build a generating station at Arnprior, but felt a number of problems might arise through the location of a generating station within the municipal limits.

The community liaison committee w
established at the request of Arnpr
town council and is made up of repres
tatives of the council, the councils f
Fitzroy, McNab and Pakenham townshi
the Lower Madawaska Planning Boa
and a number of citizens. Acres and Hy
personnel attend the monthly meetings
keep committee members informed
what's going on at the site.

On the last Thursday of each mor
the group gets together for a compl
exchange of information concerning
project and the problems encountered
both municipal and project personnel.
far, it's worked out extremely well," s

chibald, the last Laird of the McNab, was a leable rogue who figures prominently in ıtawa Valley lore. McNab, who built this nnsion overlooking Chats Lake, was chiefly sponsible for founding the town of Arnprior the early 1800's. Right: concrete for the nprior project is produced by an on-site tching plant.





lr. Cranston.

He says, for example, that Arnprior is get its Highway 17 bridge rebuilt "long before we expected it and Acres engineering investigations have determined our wn water needs would be best served installing a control weir rather than running a line from the dam to the filtration ant."

"Generally speaking," Mr. Cranston ds, "the project has been well received the people in the area, although there some whose homes or cottages are cated along the Madawaska who haven't en too kindly to the development.

"But we're an expanding town and we

The hum of the sawmill is about as famili today as it was in the 1800's just outside th town limits of Arnprior. It was through th thriving lumber industry of the Madawasl Valley that Arnprior came into bein



all realize there could be some real benefits through the creation of the new lake such as beaches, canoeing, fishing and the like. That means that people from the surrounding areas will be able to take advantage of the added recreational facilities and more tourist dollars will be pumped into the local economy."

Naturally, there are those who disagree. One 86-year-old farmer doesn't welcome Hydro's property assessors or agents on his 100-acre spread, of which he stands to lose about 30 acres to the headpond. He and his father before him have raised beef cattle in the Madawaska Valley for over 100 years and now his son has taken over.

"How would you like it if someone told you, you were about to lose your livelihood – or even part of it?" he asks.

Among those in favor of the project is a 90-year-old retired teacher who is looking forward to the replacement bridge to "get rid of that eyesore to our town." She still drives her own late-model car.

Construction of the Arnprior plant will involve about $15 million in wages – a large percentage of which will be spent locally.

R. A. McLellan, personnel officer at the project, says there's a ready labor market for the job despite the abundance of local industry. He adds that some manufacturers are worried that the relatively high wage rates will cause some workers to defect to the project.

Recruitment is being carried out through local Canada Manpower centres in co-operation with the unions. Preference is given to suitably qualified local residents. Workers with any amount of seniority in industry are being advised not to leave their jobs to seek employment at the project, where they could be laid off at short notice.

"It is not anticipated that any one area in the entire job can provide more than two years of continuity of employment for any class of worker," Mr. McLellan says.

Henry Mains, manager of the local Canada Manpower centre, says his office is attempting to discourage an influx of workers from other parts of the province.

Workers have been pouring into town from Niagara Falls, New Liskeard and Sudbury, he says. "They're people who have worked for Hydro or Acres on previous projects and who want to make a big dollar here. But our Ontario regional office is advising Canada Manpower centres across the province that we have plenty of workers available locally for the job."

Ontario Hydro is no stranger to Arnprior. There's been an area office in town for many years. While Arnprior has an elected commission, there are no utility staff, and Ontario Hydro looks after the town's electrical needs. Area mana M. H. Howat doubles as Arnprior Hy manager and operates the 9,000-kilov electrical distribution system.

Hydro has opened a second office Arnprior, just off the main street, si announcement of the project. It's fr here that a team of property apprais and agents operates to acquire land for main dam and powerhouse, headpond relocation of the CPR main line, wh runs through the affected area.

The Madawaska has been a source energy since the early 1800s when s eral mills derived mechanical power fr

ne of the main reasons for building Arnprior enerating station is to correct environmental roblems along the lower Madawaska resulting om the peaking operation of upstream plants, particular the 153,000-kilowatt Stewartville ation, below.



s fast-moving waters. The first hydro-ectric development was probably the nall generating station at Black Donald, uilt in 1901 and abandoned in 1947. The ation provided power for a graphite ine. A hydro-electric development began peration in Arnprior in 1911 and was shut own 20 years later.

In late 1916, M. J. O'Brien Ltd. began onstruction of a generating station with 30-foot head at Calabogie. The two-unit, 000-kilowatt plant which came into rvice a year later was purchased by ydro in 1929 and is still feeding power to the provincial grid. The dam was rebuilt in 1968 and the old plant automated.

In 1942, Hydro again tapped the Madawaska's power potential with the completion of the 40,800-kilowatt Barrett Chute station. The plant was enlarged in 1968 and the two units installed at that time brought its capacity up to 152,400 kilowatts.

Hydro began construction of yet another station, Stewartville, just as the curtain rang down on the Second World War. Three 20,400-kilowatt units were installed and the station came into service in 1948. Twenty years later, construction forces added two 45,900-kilowatt units to bring the station's capacity to 153,000 kilowatts.

The largest generators on the river, two 59,750-kilowatt units, were brought into service at Mountain Chute in 1967. In commemoration of Canada's 100th birthday, the 22-mile long artificial lake created by the building of the dam was named Centennial Lake.

Another peaceful lake will have been created and tranquillity restored to the Madawaska when the project at the foot of Arnprior's De Costa Street is completed three years from now.

UTILITY CONFERENCE
COVERS A BROAD SPECTRUM

D. M. Seat



Energy shortage hard to believe, says Seath

AMEU President D. M. Seath told delegates that the concerns for energy, both provincially and globally, could be considered as being uppermost in the minds of people at the present time.

"Suddenly, we appear to be in a situation with regard to energy which many consider to be of crisis status," Mr. Seath said. "There is the story of a man who ran out of gas recently on a superhighway. The policeman who came to his rescue pointed out that his fuel gauge registered empty. 'I know it says empty', the man said, 'but I didn't think it was empty because it hadn't been on empty long enough'.

"It has been said that this is the spirit in which society is facing many of the energy problems. After decades of abundance it is very hard to believe that shortages are near. How close the needle is to empty and how accurate the gauge is in Ontario – this is something that must receive critical and responsible examination.

"Energy derived from non-renewable resources such as fossil fuels has recognizable limits and it would seem realistic to observe that however it is generated, electrical energy would seem to be energy of the future."

There are many visionary and practical approaches to the generation of electric energy," Mr. Seath added. "But in whatever manner energy is made available it is imperative that it not be wasted. Probably the most immediate and responsible approach that can be taken to the energy situation is to recognize its intelligent use."

If the public can be made aware of the wise use of electricity without an over-reactionary or alarmist approach, but rather on a practical basis, he said, then the electrical industry will probably have time to allow technology to provide for future supplies of energy.

Turning to the issue of regional government, Mr. Seath said the matter is under active consideration by the provincial government and there are some "very obvious effects" for the municipal utilities.

"It is imperative that the AMEU act positively to any proposed change insofar as it may affect our operation by assessing recommendations and proposing reasonable alternatives where necessary."

Mr. Seath said the AMEU will be represented on a committee established by Premier William Davis to make recommendations on the role of electric utilities in any proposed regional government area.

"We have been assured that the voice of the people involved will be heard and we have indicated our insistence that this procedure is necessary. When we speak of people we refer to the people we serve – our customers. We have also made it clear that it is absolutely necessary that those people who have made the electric utility business their career must be considered in any change.

"The determination of the eventual number of utilities, their size and their political interface with regional governments must be considered in a democratic manner, with all the facts made known before any decision is taken.

"The faculty to make these facts known has been accorded to the AMEU and it is our responsibility to the people we serve that we are forceful, practical and responsible in our efforts to ensure that the dramatic success story of Hydro in Ontario will have many more chapters which will be read with interest and to the benefit of the people of Ontario," Mr. Seath added.

GOVERNMENT
Bigger political say in energy: White

Greatly increased governmental influence is needed in all segments of the energy industry for the economic benefit of the province, D. K. White, North York Hydro's general manager, told delegates.

Mr. White was moderator of a panel set up to discuss "a positive approach change" in the electric utility industr

He said the problems of energy supp are "just too big" to be left to individu segments of the community and solutio have a high political content because the need to import large amounts energy.

"There is a further fast-growing impet for more governmental influence on t industry – the supply and use of energy receiving more interest from the publ both for conservation and environmen reasons," Mr. White said.

"Most of us in the industry will not ta too kindly to increased governmental i fluence in the business, but it looks li we had better get used to it."

However, Mr. White foresaw sor opportunities for the electric utility indu try not only to provide a special service customers but to protect its futu interests.

These opportunities, he said, are in t area of efficiency of application of ener and they have "the double-barrelled eff of both conservation of energy and redu tion of environmental degradation."

"North Americans," he charged, "ha dealt with their energy supply in much t same way as with most of their otl natural resources – wastefully. That's l cause these resources were relativ cheap. Our producers have been able evade the penalties of a high wage str ture because they got their metals, fu and lumber at what amounted to barg prices.

"This is probably more true of the U than of Canada, but only because the U had a head start and more people.

"As a result the U.S. became the ma world power and evolved a standard f living unexcelled in all history. Because f our proximity and the fact that we had l opportunity, our economy and life-st followed theirs," Mr. White said.

He added that the patterns of ene use in Ontario have been very much those of the U.S., which has 6 per cen the world's population and accounts 35 per cent of world energy consumpt

lajor problems confronting the electric tility industry including increased govern- ent involvement, environmental pressures, e energy crisis and switches in advertising olicy come under the spotlight at the ssociation of Municipal Electrical Utilities ummer conference in Niagara Falls.

D. K. White



"The interesting difference," he said, s that Ontario has but very little indig- ous energy supply."

Quoting the Advisory Committee on hergy's report, Mr. White pointed out at Ontario is dependent upon others for ore than 80 per cent of its energy quirements.

"However, to some degree Ontario is eltered from the energy problems of the S. by the reserves of natural gas, oil and al in Canada's Western provinces and the powers of the National Energy ard. But this protection cannot be ex- cted to continue indefinitely when the S. and all the world has energy prob- ms of their current dimensions."

The most severe problem in the U.S., he id, is the natural gas supply. Gas is sentially a by-product of oil exploration d federal price controls, essentially at 50 levels, have made it cheap to use. o much so that they are down to 11 ars' supply and willing to import liqui- d natural gas to the eastern U.S. at what pear to be phenomenal prices."

Moreover, Mr. White said, contracts for uified natural gas are confronted with pidly escalating tanker costs and the t that handling facilities are limited. He ggested these forces will tend to in- ease the wellhead price for Canadian tural gas.

Referring to Alberta Premier Peter ugheed's stand on the price of natural s, Mr. White said: "He would be remiss his duty to those who elected him were not to press for higher gas prices."

Mr. White said there is no shortage of al in either the U.S. or Canada, but one ficulty is in using it in a way acceptable the public, particularly the environ- ntalists. The other problem is trans- rtation. "The ACE people suggest that ure emphasis will be on gasification of al to overcome the transport cost oblem."

Mr. White suggested that the major dif- ence between Ontario and the U.S. is space-heating requirements. "Because tario is such a big user of fossil fuels d because we import so much of them we are particularly vulnerable to spill-over of U.S. energy problems.

"Against the background of supply problems we must measure the growth in energy requirements to reasonably sustain our economy. The 1990 estimate is 5,700 trillion BTUs as against a 1970 usage of 2,350 trillion BTUs, a growth of 2½ times. About one-third of the 1990 use will be required for industrial purposes, about one-fifth for residential and commercial use, about one-fifth for transportation and the remainder for other purposes, mainly losses.

"In the provision of all this energy and in containing its cost to protect our economy, Ontario has one bright hope – the apparent resounding success of the CANDU nuclear system. This may supply some leverage in meeting the energy need and holding down its cost. Nuclear power plants are expected to produce nearly one-quarter of the 1990 requirement.

"In the same period, however, the annual need for oil will have grown from 184 to 420 million barrels and for natural gas from 440 to 1,400 billion cubic feet.

"There is only one conclusion. In the interests of the economy of this province it is inescapable that there be greatly increased governmental influence in all segments of the energy industry," Mr. White declared.

But, he said, the ACE study has suggested that "application of improved technology to space-heating problems offers the greatest scope for economy of energy use in the residential-commercial sector.

"The electrical industry has experience in promoting better insulation standards and was successful in getting their acceptance. Perhaps we can go out in front again and evolve something still better and maybe get it accepted for all such structures. It's possible to effect a 10 per cent heat-saving in new homes and by so doing the annual saving in 1980 would be six trillion BTUs – a million barrels of oil.

"And we could provide more impetus to the development of a reliable heat pump for use in our latitude and not only economize on heating but provide our customers with summer comfort as well," Mr. White said.

ENVIRONMENTALISTS
Attacks on electric industry 'ironic'

It's ironic that the electric utility industry should be attacked by some of the segments of society that have benefited by its presence, D. B. Ireland, Ontario Hydro's assistant general manager – regions and marketing, told delegates.

"Looking at society generally," Mr. Ireland said, "it is apparent that the business community has been largely responsible for effecting the changes which have led to the successes realized in improving the quality of life. The electric utility industry has made a major contribution in this regard."

He said that the people who have benefited most by the presence of the electric utility industry are now charging that the physical basis of society is being destroyed by the industry's "multiplying the noxious side-effects of our technology and, or, exhausting our irreplaceable resources."

Environmentalists have used very effectively every device available to them, including political lobbying, in their attempts to bring big business to heel, Mr. Ireland added.

"Intertwined with this movement, and yet somewhat apart, is a social movement known as consumerism exerting pressures for acceptance of their beliefs in almost an identical manner. This is the climate in which business is operating today. And it's the climate in which Hydro in Ontario is operating and will have to continue to operate in the foreseeable future."

Mr. Ireland said that because Hydro is big, because it's publicly-owned, and because it's a monopoly, it will be under more extreme pressures to respond to these varying demands than will private enterprise.

"Our stance in the energy market has been challenged by many because not

D. B. Ireland



H. K. Wrig



only is the production of electric energy relying to an increasing degree on foreign resources, but the use of these resources is degrading our environment.

"We're looking to nuclear power with increasing confidence and hope as the solution to the air pollution problem. However, nuclear power's thermal effects and radiation are still suspect. While uranium is an indigenous fuel and currently available in quantity, nuclear power requires high capital investment in plant to the point where sufficient money may not be available in the economy to finance it and continued reliance may be necessary, to some extent, on fossil-fuelled generation.

"In any event, the cost of electric energy will continue to rise, as will the cost of all energy. It is forecast that in the longer term the relative position of electric energy costs will improve. More recent events in the gas and oil industries lead one to believe that this may happen much sooner.

"In any case, I'm convinced that the way of the future is the electric way. It is extremely important, therefore, that we not let our long-term objectives be obscured by misleading short-term distractions posed by our critics," Mr. Ireland urged.

Mr. Ireland said that as long as Hydro in Ontario has the responsibility of operating one of the larger utility systems in the world and the electrical needs of 2½ million customers to supply, there must be an interface between the two. That interface is, in common-day parlance, the market place.

"One very important facet of the business transactions we conduct in that market place will certainly include sales activity of one form or another. The type and manner of our sales activities have never been static – they have changed in the past and will continue to change in the future. We must be flexible in our approach to the market.

"Ontario Hydro has been under considerable pressure from the government, the environmentalists, and the public generally, relative to several areas of its operations: plant siting, transmission line locations and power corridors, and the advertising program.

"Without any appreciation of the basic problems and what competing private enterprise is doing, they interpret our product advertising as growth for growth's sake and they just cannot hear any arguments to the contrary.

"However, there is a basic inherent growth factor in the power system that is geared to the economy of the province and I'm convinced that our advertising has little or no effect on the load demands appearing on the system. Annual increases in demand of 7 per cent will continue whether we advertise or not, as long as the economy of the province is strong.

"This has been our history over the past 60 years. However, I'm not implying that we will reduce our efforts to encourage wise and efficient use of electricity – quite the contrary.

"If these programs are successful we may on the one hand reduce this growth rate. On the other hand, if a shortage of fossil fuels develops, electricity may be called upon to supply a much greater share of space-heating needs resulting in an upward change in growth rate."

Mr. Ireland said Hydro's advertising has been directed mainly at the residential market to help maintain efficient use of the distribution systems and keep unit energy costs to a minimum.

"However, our advertising is a visible thing, and the fact that we are big, we are public, makes us an attractive target for those wishing to attract attention to themselves," Mr. Ireland said.

MARKETING

Utilities 'responsive to customer'

The electric utility is responsive to the needs of its customers and has avoided the uncaring and often bureaucratic approach that frequently appears to plague both public and private enterprise, said H. K. Wright, Ontario Hydro's director of sales.

"Our commitment to customer servic and to communication through both t individual utility's and our co-operati marketing programs of the past deca have brought us in more direct conta with our customers, and resulted in t local utility having an acceptance a support from the customer that is envi by many other organizations."

He stated, however, that electric ut ties have now entered into an era in whi it becomes necessary to alter, and ev discard, many of their advertising and p motional practices if they are to contin to enjoy the support and confidence their customers and the public at larg

He cautioned, though, that "we must careful that, as we introduce our chang it is not taken to mean that utilities going out of the marketing business. still have a big job to do to keep in dir contact with our customers, to know th requirements, to inform them of uti services and of the advantages of el tricity for many key applications. And must depend more on the efforts of a w trained field marketing staff for accor lishing this.

"As I see it, the challenge facing electric utility industry, in fact the t energy industry in North America ri now, is that of recognizing the merit learning to do the marketing job in 1970's without the use of many of traditional advertising and promotic practices, and particularly without the centive programs that are load-buy approaches to meeting the competitio

"We have to do our job recognizing special long-term energy responsibili that we in the electrical industry hav Mr. Wright said.

He suggested that the future respo bilities in the electrical industry in pro ing the energy requirements of province are markedly different from th of the oil, gas and coal sectors. Beca of this, the electrical industry must h both short- and long-term objectives programs that differ from those of competition.



C. W. Palmateer

"In this respect, I believe the way the ...ility industry originally approached the ...arketing of electric heating in Ontario is ...good example of the direction we must ...entually follow across all our markets. ... the start, we pursued a course that de...loped the quality and performance of ...ectric heating equipment and the insu...tion of the building it went into.

..."Participation and leadership in the de...lopment of the CSA national electric ...eating standards along with the technical ...idance we have given to manufacturers ...d on-site trades, and the insulation in...ection of new electrically-heated dwell...gs, are representative of what can be ...complished to ensure the responsible ...e of electricity and to develop the sys...ms and equipment needed now and for ...e future.

..."In a smaller manner, it is necessary ...at an increased part of our marketing ...sources be directed in the future toward ...suring effective and efficient application ...d development of other electrical ...stems and equipment.

..Mr. Wright stated that many marketing ...ograms already reflect selective change, ...ut they are not programs we can always ...ter immediately and without regard to ...e existing efforts of the competition.

..."Water heating represents a consider...le portion of most utilities' residential ...ad; and revenue from this source, along ...th the substantial capital investments in ...ntal water heaters and other plant, must ... protected through marketing programs. ... the Cascade water heater, the perform...ce of which is certified by CSA and ...ich is manufactured with a 10-year war...nty, we have a proven product that ...ficiently meets the consumer's hot-water ...quirements. Sales and marketing pro...ams, including local media advertising ...at is service-oriented, must continue to ... sure that customers are aware of the ... lity's Cascade service and can thus ...ake an informed selection of water-... ating equipment.

Ads will stress wise use

Outlining Ontario Hydro's changing advertising philosophy, C. W. Palmateer said the main objective will be to encourage the wise and efficient use of electricity and other forms of energy.

Mr. Palmateer, Hydro's advertising manager, said one of the program's goals will be to make known to the people of Ontario the benefits and advantages of electricity. "This is a valid responsibility so the customer can make an informed choice in his selection of energy sources," he said.

Another objective is "to encourage uses of electricity which are consistent with the social, economic and ecological interests of the people of Ontario."

Mr. Palmateer pointed out that current and future advertising will be structured with these points in mind. "In addition, Hydro advertising will stress the service features of our product and the services available to our customers."

Hydro ads will also talk about the need for a mix of generation – hydro-electric, fossil fuels and nuclear; the future role of nuclear-electric generation using Canada's uranium resources and its probable contribution to future stabilization of costs and rates. "In the meantime, we will try to condition the public to the phenomenon of rising costs," Mr. Palmateer said.

Cascade water-heating advertising will be continued to protect the $75 million investment the Hydro "family" has in rental water heaters across the province, but the ads will urge customers to avoid waste.

Electrical modernization advertising will stress safety, insulation and efficiency of electrical equipment.

RATES
Hydro against high minimum bills

Ontario Hydro is opposed to applications from municipal utilities for minimum bills that exceed $3.50 a month per customer, said E. G. Bainbridge, Hydro's director of consumer service. Hydro will also resist too quickly a change by utilities to the $3.50 minimum bill level because of the more serious impact on customers with minimum use of energy, he added.

Average minimum bills for residential customers are now $2.75 to $3.00 and Mr. Bainbridge said some proposed increases would be "unconscionable."

"Minimum bills," he added, "are not to be construed as a penalty charge. The amount simply has to be sufficient to cover the administrative cost of providing a customer with minimal service."

Mr. Bainbridge said Hydro has always had to face criticism by the utilities following an announcement of a wholesale rate increase, and that criticism has been in the form of "why didn't you tell us this sooner?"

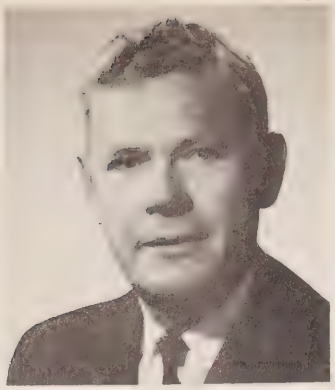
He added: "I can tell you even now that wholesale costs will continue to increase throughout and beyond the period of our normal five-year forecast. There seems to be no way that we can avoid these increases."

Mr. Bainbridge said the effect of rising fuel costs on the wholesale rates had become increasingly evident.

"We have been aware of this for several years. However, we did agree at the time of the adoption of the new wholesale costing procedures in 1966 to hold a fixed energy-costing rate for at least five years. In doing this, the burden of increasing cost including wages, materials, fuels and their inflationary components have all ended up as charges totally on the demand side of rates.

"Last year, we recognized the inevitable upward trend of the energy portion of the rate and started to increase it from 2.75 mills to three mills. We're convinced the energy-costing rate could easily be justified beyond the five-mill level in the not too distant future and it is being proposed that over the next few years this energy rate be annually increased until it approaches a more appropriate level," Mr. Bainbridge said.

E. G. Bainbridge



He added that "within the changing scene to energy conservation with its wiser, more effective and more moderate use, there is a lot of talk from the outside that suggests an inverse rate philosophy.

"I hasten to assure you that I personally do not subscribe to such a proposition, but to meet the challenge we must ensure that the end rates of the residential structures are fully adequate to meet local utility costs associated with the purchase and distribution of energy," Mr. Bainbridge said.

ENERGY USE
Moving to nuclear energy base

Any serious study of the world's energy supply suggests that a medium-term solution extending into the long-term is the replacement of the present fossil-fuel energy base with a nuclear energy base.

But, says George Wilkinson, manager of Westinghouse Canada Limited's utility sales division, the question is not whether the electrical industry should develop nuclear fuel resources, but rather the rate at which it should be done.

Mr. Wilkinson said that because changes in the world energy picture will take place over a considerable time, it is important to conduct any discussion within the context of a clearly-defined time span. He suggested that delegates consider from 1973 to 1990 as short-term, from 1990 to 2010 as medium-term, and the years thereafter as long-term.

He said that in discussing world energy supply it is necessary to resolve the immense quantity of energy units involved and to set down these quantities in manageable form. For simplicity, he said, he would use a measurement called a Q – one million trillion BTU's.

Mr. Wilkinson said the total recoverable world supply of coal is estimated to provide 170 Q's of energy. Oil provides 13 Q's, and natural gas 10 Q's. Nuclear energy without the fast-breeder reactor provides 69 Q's while oil shale and tar sands are estimated to provide 20 Q's, and world hydro-electric sources 0.1 Q.

"Authorities," he said, "differ in opinions of what the growth rate of energy use will be. At 4 per cent, the year of depletion of all conventional energy supplies would be 2080; at 6 per cent, the year 2050. Either way, however, all conventional supplies would be gone in 100 years."

Mr. Wilkinson pointed out that on a fuel-by-fuel basis, 60 per cent of the resources are coal. However, coal accounted for only 38 per cent of the total energy consumption in 1972.

Oil, by contrast, is only 5 per cent of total energy resources, but accounted for 40 per cent of total consumption. Natural gas represents 4 per cent of the world's ultimate fuel supply, but accounted for 20 per cent of the 1972 world energy consumption.

"The significant point," Mr. Wilkinson said, "is that while these conventional fuels represent about 69 per cent of the supply, they accounted for 98 per cent of consumption in 1972. Oil and gas together provide only 9 per cent of the world's fuel supply, but account for 60 per cent of consumption. At this rate, these two non-renewable resources will be gone in 40 to 50 years."

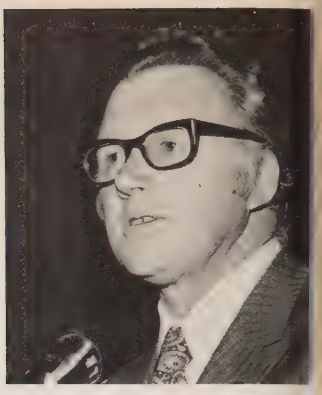
"We know we can make synthetic crude oil and gas from coal, and we expect that a great proportion of the coal supply will have to be reserved for this purpose in the future. So coal can help us buy time – but not much," Mr. Wilkinson said.

However, he added, the picture beyond 40 to 50 years is not a bleak as might be inferred by these figures. Fortunately, there are two new energy sources available.

"One, the fast-breeder reactor, brings an enormous increase of 420,000 Q's to the world's total energy resources. Fusion technology, using the deuterium content of the oceans as the basic fuel, adds the astronomical amount of 10 million Q's of energy to the fuel picture.

"And the addition of the breeder reactor at a 6 per cent growth rate of energy use would extend the world energy supp into the 38th century. Fusion, which w be the ultimate solution, will add 400 500 centuries to the world's energy su ply," Mr. Wilkinson said.

G. Wilkins



In presuming a future all-nuclear bas Mr. Wilkinson said the other possib energy sources as geothermal pow wind energy, tidal energy and solar ener had been dismissed.

Geothermal power can furnish only ni one-thousandths of a Q annually, wi energy is probably at best good for thr one-thousandths of a Q annually, ti energy is less than one-tenth of a annually and solar energy will require co siderable technical development before can make a significant contribution to t energy resource problem.

This development would include t design of economic collectors of so radiation ten times more efficient th those currently available; development a heat transport system to supply so heat to the steam turbine, and an effici method of energy storage during perio of non-solar radiation.

Mr. Wilkinson added that developm of solar plants is expected to be on ab the same time-scale as fusion, so t even if the developments are success they will not be available until after turn of the century.

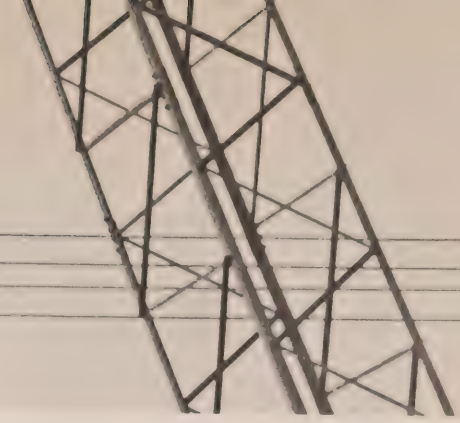
"The inevitable conclusion of all this that we are approaching an era wh virtually all energy will come from so nuclear reaction source."

He predicted that the shift in ene sources will bring accelerated use electricity. "Electricity, with its grea availability and greater efficiency, have to substitute for various prese day fuels.

"We will rely more and more on el tricity for water heating and cooking we phase away from oil and gas. We m shift to more efficient heat for homes a commercial buildings. And as world s plies of oil run low, gasoline becomes l and less available for personal use, more efficient electric automobile come of age."

along hydro lines





Dr. Lewis retires

Dr. W. B. Lewis, one of the pioneers of Canada's nuclear program, has retired from Atomic Energy of Canada Limited. Just prior to his retirement he was honored by the Canadian Nuclear Association for his contribution to the nuclear industry.

In 1953, Dr. Lewis predicted that nuclear power would be used extensively in Ontario as an alternative to fossil-fired generating stations. He suggested that by 1980 nuclear power would save Ontario $300 million annually in coal costs. Now, on his retirement, he can reflect on that prediction knowing he was correct. His retirement came just two weeks after Hydro announced a $3.5 billion program with emphasis on nuclear power.

Dr. Lewis was born and educated in England. During the Second World War he played an active role in the development of radar. He came to Canada in 1946 and was appointed director of Atomic Energy Research at Chalk River. He has been active in the Canadian nuclear program ever since and has been described as the "real brains" behind Canadian nuclear technology.



Dr. Lewis (left) receives award from CNA's W. M. Gilchrist.

Among honors Dr. Lewis has received are the Royal Medal, from the Royal Society; Outstanding Achievement Award of the Public Service of Canada; Companion of the Order of Canada and the Atoms for Peace Award. At the CNA convention he was made an honorary life member of the association. At the same time, the CNA established the W. B. Lewis Medal to be presented annually to deserving scientists or engineers for achievements in the nuclear field.

'Without a whimper'

Ontario Hydro's change in status from a commission to a corporation came about with "nary a whimper," Andrew Frame, a past president of the Ontario Municipal Electric Association and member of the Task Force Hydro steering committee which recommended the change, told a District 5 OMEA meeting in Port Dover.

Mr. Frame said that because there was no outcry from the mayors and reeves of the province, the OMEA was not very effective in its fight against the change to corporation status.

He said that he, personally, could get neither the support of his local mayor nor member of the Legislature. "I suppose the current investigation into Ontario Hydro's new head office may have something to do with it, but there's just no public sympathy toward our cause.

"And the municipal councils have been too busy trying to get local commissions as a committee of council that the status change went right by them.

"If things change for the worse, the municipal councils will have to be held responsible," Mr. Frame said.

"Local commissions," he added, "have a great deal of work to do and the new Hydro board of directors is the key. The government has stated that the new board will consist of a chairman, president and 11 directors. This new board must have widespread municipal representation.

"The OMEA is still the beneficial owner of Ontario Hydro, therefore it is imperative that we must have substantial representation on that board. I believe the vice-president, president, and past president of our association should be on the Hydro board. There should also be a municipal mayor or reeve and the legislation makes provision for members of the Legislature. There is no place for civil servants on that board. We must work to ensure that those appointed are elected members of the Legislature to reflect the will of the people," Mr. Frame urged.

He pointed out that the separation of Ontario Hydro from the government remains – that Ontario Hydro is not meant to be a department of the provincial government and, in this instance, the board concept is different.

Mr. Frame said the term Crown corporation does not appear in the bill, even though it's being used in the news media. He said the prefix Crown appears to have been carefully avoided and he has never heard it used by any Cabinet ministers or members of the government.

Turning to rate review proposals, Mr. Frame said: "We must have representation on the expanded Ontario Energy Board. After all, the OMEA's power costing committee has been a form of rate review board for many years."

Spokesmen for Hydro

There is a definite need to increase public understanding of Ontario Hydro matters, says E. R. Alexander, provincial president of the OMEA.

Speaking at the OMEA District 5 meeting, Mr. Alexander called on municipal electric commissioners, government and industry to "make public statements necessary to ensure the viewpoints of a vocal minority are not interpreted as the will of the majority."

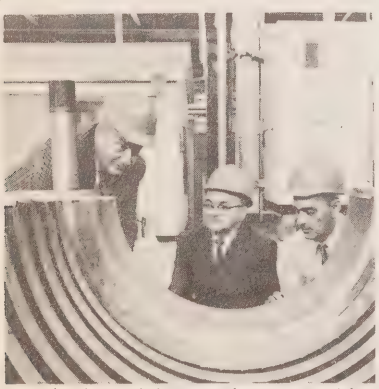
Mr. Alexander said the need for public understanding is quite apparent, and being a public body Hydro has not been able to defend itself from the detrimental

charges levelled against it.

"There are charges that Hydro is damaging the environment, it is indifferent to public concern and other little criticisms that are hard to answer and that gradually undermine confidence in the system.

"We, as municipal trustees in the Hydro organization, must make public statements that ensure the work and needs of Ontario Hydro are understood. And we must also ensure the consequence to the public in costs and inconvenience of actions that delay or deny needed generation or transmission lines is properly interpreted and expressed."

Turning to the recently-announced Ontario energy policy and expanded responsibilities of the Ontario Energy Board to include a review of Hydro rates, Mr. Alexander said it has been stressed that the board would not be a regulating body.



District 5 delegates inspect turbine casing at Nanticoke GS prior to their meeting.

"It's anticipated that the rate review process will offer advice and guidance, may have a modifying effect on rate proposals and provide an opportunity for Ontario Hydro to gain public understanding," Mr. Alexander said.

He added that Premier William Davis, W. Darcy McKeough and "others with responsibilities in the energy field" have indicated that the role of the OMEA is of increased importance as a result of the change in status of Ontario Hydro from a commission to a corporation.

"It has been said to the OMEA executive on a number of occasions that it may not be possible to be invisible as we have in the past. The OMEA may well be required to act as an intervener at the rate review hearings conducted by the Energy Board as well as the public spokesman of municipal views on government policy as it relates to energy and the Hydro picture.

"It is essential that the OMEA influence Ontario Hydro policy decisions – particularly as they affect municipalities and the ultimate customers," Mr. Alexander said.

Hot water derby

Remember the old song "Cruising Down the River"? Well, cruising down the Niagara River was a big hit with 11 delegates to the AMEU's summer conference.

They were participating in Ontario's first hot-water heater race. Since the meeting was at Niagara Falls, it was decided to hold the event in the treacherous currents between Queenston and Niagara-on-the-Lake.

Perhaps inspired by feats of daredevilry in past years on the Niagara, Harold Brownhill, general manager of host utility Niagara Falls Hydro, was responsible for organizing the race.

The rules were simple. All craft were to be constructed from old hot-water tanks and the mode of propulsion was limited to sail and paddles. There were no restrictions on the number of crew members.

Unfortunately for Mr. Brownhill, who may have had visions of winning the historic event right in his own backyard, victory wasn't in the cards. The first vessel across the finishing line at the end of the six-mile course was piloted by Grant Halliwell, from Mitchell Maintenance in Toronto.

In fact, much to the embarrassment of the Niagara Falls crew, their entry was the only one which didn't finish the race. At the half-way point their vessel, the



Setting s

40 Galleon, lost her rudder and began taking on water. A co-operative motorboat dragged the red-faced sailors to shore.

Undaunted by their bad luck, Mr. Brownhill and crew Paul Lowe and commission chairman Vin Johns are already considering design modifications for nex year's event, which could well be held or the Rideau River, near Kingston – site of the 1974 AMEU convention.

New energy minister

After an absence of about 11 months, W. Darcy McKeough has been returned to the Ontario Cabinet as head of the ne Ministry of Energy.

Mr. McKeough resigned from the pos of Provincial Treasurer about 11 months prior to his new appointment. In the interim he served as parliamentary assistant to Premier William Davis with special responsibility for energy matter

Mr. McKeough was author of a sweeping energy policy for Ontario tabl in the Legislature by Premier Davis in June.

Richard M. Dillon, executive director of Task Force Hydro and former Dean of Engineering Science at the Universit of Western Ontario, has been appointec deputy minister. His appointment as Mr McKeough's right-hand man came at a time when he was working with Hydro

an advisor on TFH proposals.

"In my new position I feel I will be able use the knowledge and experience gained with Task Force Hydro to the mutual advantage of all concerned," he says. "In the formation of government energy policy it is important that Hydro's point of view be understood and appreciated." Mr. Dillon's first job will be to supervise the staffing and organization of the ministry.



W. Darcy McKeough



Richard M. Dillon

Mr. McKeough was first elected to the Legislature in 1963 in the then Chatham-Kent riding. He made his mark early in his political career as a member of the group of young, well-dressed Conservative backbenchers nicknamed the "Chicago Gang" by the Liberals and New Democrats for their devastating heckling of the Opposition.

In his fast rise up the political ladder – he was Municipal Affairs Minister within three years – Mr. McKeough's energy and gusty style have won him considerable respect around the province.

New secretary

William E. Raney, Q.C., has been appointed secretary and general counsel of Ontario Hydro. Mr. Raney succeeds E.B. Easson, who has retired after 25 years as secretary.

A third generation lawyer, Mr. Raney is son of Fraser Raney, Q.C., a life bencher of the Law Society of Upper Canada, and is a grandson of the late Mr. Justice W. E. Raney. He was called to the Bar of Ontario in 1948 and was created a Queen's Counsel in 1964.

After a brief period of private practice, Mr. Raney joined Ontario Hydro in 1948 as an assistant solicitor in the former legal department. He was named senior solicitor in 1958, became deputy general counsel in 1960 and general counsel in 1967.



William E. Raney, Q.C.



E. B. Easson

Mr. Easson was born in Ottawa and attended elementary and secondary schools in the nation's capital. He graduated from the University of Toronto in 1930 with an honors degree in commerce and finance and joined Ontario Hydro as assistant municipal accountant in September of that year.

Mr. Easson served overseas as a member of the RCAF and rejoined Hydro in 1946 when he was attached to the office of the chief engineer – design and construction. He was appointed secretary to the commission in 1948.

Hello, dolly

Ontario Hydro researchers have developed a powered water-heater dolly for use in lifting water heaters up and down stairs. The dolly, which should soon be on the market, is expected to be of great benefit to the contractors who annually install about 25,000 water heaters across the province.

Alex Kemp, Hydro's wiring and water heating technical co-ordinator, says old heaters are sometimes full of sludge, making them even heavier to move.

Investigations showed that none of the available pieces of equipment for moving water heaters up and down stairs was satisfactory. As an example of the loads involved, a 60-gallon stone-lined heater weighs 400 pounds while a glass-lined one of similar capacity weighs 300 pounds.

Mr. Kemp says that in the past year, most water heaters installed have been 60-gallon rather than the old 40-gallon units, aggravating the transportation problem.



Easy, boys

Dubbed the Mark 5, the new dolly is the fifth prototype developed. Designed to be operated by one man, it features two sets of three wheels, each set working as a single unit.

Together again

Ontario Hydro's Georgian Bay regional office staff are moving into new quarters in September. Previously, they were scattered in four different locations around Barrie.

The largest office Hydro occupied was in Barrie city hall. Regional manager Ray Griffin says city council indicated it would require the space for expansion.

The new office, built by Kemp Bay Developments, is on Bell Farm Road and provides about 15,500 square feet on the ground floor and 1,500 square feet of storage space in the basement.

Mr. Griffin says there's about 3,000 square feet off a common lobby which Kemp Bay will rent to other tenants for the present. This space could be made available to Hydro should the need arise. The new building is air-conditioned and electrically-heated.

Info trailer

An information trailer has been put into service in the London-Nanticoke transmission line study area in an effort to acquaint people with Hydro's power-line requirements.

The trailer, equipped with maps and other information, has been stopping at towns along the way to explain the need for the line, the participatory process by which alternative routes will be considered and hear suggestions from individuals and local organizations. This fall, public meetings will be held at which further input from those affected will be sought.

Citizen of the year



In recognition of his involvement in community affairs, Aurora Hydro Chairman D. H. (Don) Glass has been named the town's "Citizen of the Year."

Mr. Glass is a past president of District 4 of the Ontario Municipal Electric Association and is a member of the board of governors of York County Hospital, a director of the local Chamber of Commerce and a member of the Lions Club.

He is also a former member of the town's recreation committee and a former town councillor. He is shown expressing his appreciation for the tribute paid him by Mayor Evelyn Bock.

municipal briefs

Former Sarnia Hydro commissioner John T. Barnes, who was active in utility affairs for close to half-a-century, is making his mark in another field – Indian history. Since his retirement last year, Mr. Barnes has devoted his time to research into the myths, institutions and culture of the Chippewa Indians and now has a 250-page manuscript he's called "Chippewas: Facts, Fables and Fiction" in the hands of a publisher.

Simcoe PUC plans to consolidate its facilities in the town's core area by 1975. The utility has purchased a six-acre site for a new $225,000 complex. At present, the utility has offices in two locations and operations "are spread all over town," says manager I. B. Sveinbjornson.

Windsor housewife Mrs. Stanley Cecile has offered a "tip of the hat" to a Windsor Utilities Commission line crew who removed their hats as her father-in-law's funeral procession went by. Mrs. Cecile said the crews removed their hard hats and stood smartly at attention until the procession had passed.

Atikokan Hydro's manager M. H. (Marv) Kelly has been elected 1973-74 president of the Electrical Utilities Safety Association of Ontario. D. M. Seath, of Stratford, was elected vice-president. Mr. Seath is also president of the Association of Municipal Electrical Utilities.

Newmarket and Aurora Hydros have pooled resources in a trouble-call servic which operates at nights and on weekends. Newmarket manager Jim Beadle says the service has resulted in consider able savings for both utilities.

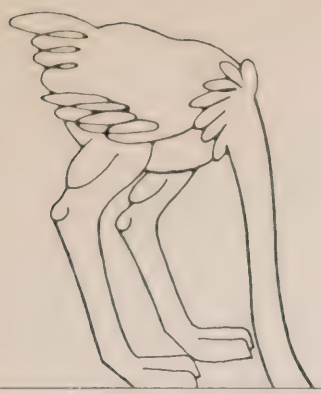
North York Hydro has issued a commemorative publication entitled "Meetir a Challenge" to mark its 50th anniversa The eight-page booklet outlines the utility's history from its formative years i 1923 until the present. It was written by freelancer Sheila Kenyon, whose byline appears often in Hydro News.

Another picnic area has been added to the scenic Ottawa Valley, thanks to Renfrew Hydro. The utility has establish a 20-acre public picnic ground at the fir chute on the Bonnechere River and say there's good fishing at the base of the fa

Just a year short of a half-century with Smiths Falls Hydro, manager George Phillips has decided to retire. His plans for retirement – "Oh, perhaps a return t school to take a course of some kind in community college." Mr. Phillips will be succeeded by Floyd Warren.

Sandy Graham has severed a 45-year connection with Fergus PUC when he retired recently as the utility's superintendent. Mr. Graham became superintendent in 1931 after having worked as a lineman for several years previousl

J. T. Atchison, of Manitoba Hydro, has been elected chairman of the Co-ordinating Council for Canadian Electri Utility Standards. He succeeds R. L. Hicks, of Toronto Hydro. Vice-chairmer elected include R. C. Bergey, of Canadi General Electric and H. N. Britton, Belle ville PUC. The council is made up of representatives from the Canadian Electrical Association, Canadian Electrical Manufacturers Association, Canadian Standards Association and the Association of Municipal Electrical Utilities and is set up to co-ordinate an promote standards activities for the Canadian electrical utility industry.



as don wright sees it

Values are changing and perhaps it's time we had another look at our monetary system. Is gold still a realistic standard when it takes half a pound of the stuff to buy a pair of nice lamb chops?

Professor George Borgstroem, of Michigan State University, has something like this in mind when he predicts that protein will soon replace gold as a basis of exchange among nations and that Norway's resources of fish will make it one of the world's leading economic powers.

Considering the distinct Scandinavian flavor of the good professor's name, this might be dismissed as an advanced case of wishful thinking. Or have you ordered lobster lately? Seems like an acre of ocean could be worth at least as much as the First National Bank.

So let's go along with the professor and suppose that fish do become the international currency and a universal medium of exchange. How would it work? Suppose we establish the mighty tuna as the top monetary unit with the salmon, mackerel, snapper and smelt following in that order of descendancy.

A pair of pyjamas, for example, might go for 1M4s (a mackerel and four smelt). Auto prices are rising rapidly and under the new scheme might fetch something like 165 tuna. Tinted glass would be an extra three salmon with whitewalls tossed in for a couple of snappers.

Sounds a bit unwieldy at best and we wonder if the professor has considered some of the less obvious problems.

Hoarders and speculators would exchange their vaults for deep freezers resulting in appliance shortages and the unwise use of electricity. Health standards would decline as cod liver oil was drained away from junior's tummy to grease the wheels of high finance.

And think what would happen to the cabs. Swapping oil for coin of the realm is one thing, but snappers are another kettle of fish. What with the hot desert sun, and all, they'd have a real stinker of a problem.

It's food for thought, if nothing else, but I doubt if the world's monetary experts are ready to follow Mr. Borgstroem back to the ocean whatever the price of fish.

■ Speaking of protein, it's reassuring to find that the boys on Capital Hill are not entirely pre-occupied with piddling problems such as unemployment and the high cost of keeping the wolf from the door. Among their concerns at a recent session was the poor shape of our wieners and sausages. Not their shape, exactly, they still being considerably less wide than long, but rather the sad state of their innards.

As one alarmed federal hot-dog authority has pointed out, the amount of protein in Canadian wieners has dropped from 14½ per cent to a measley 12 per cent in the last 10 years. They have,in effect, been knocking the stuffing into our wieners and the new legislation is designed to remedy this serious situation by putting a floor on protein content. As our expert puts it: "If manufacturers are required to add more protein then obviously they will be able to add less fat, filler and other materials."

Like the sausages themselves, legislation is only as strong as its weakest link and to the layman, at least, it would appear that the manufacturers might meet the new requirements simply by stretching the length of their products. In other words, a two-foot wiener, while awesome to contemplate, might pass the test even though it contained no more protein than a six-incher.

Surely this was an instance calling for statesmanship of the highest order with the public weal the only criterion. Could not our leaders have screwed up their courage and decreed a firm limit on the amount of filler, fat and "other materials" with which our wieners appear to be stuffed? And there is something distinctly uncomfortable about the phrase "other materials" in this particular context.

The Congress of the United States has been coming to grips with some gut issues of its own and the American people will brook no pussy-footing in a matter which is close to the hearts (and stomachs) of millions. The problem in this case is to decide how many peanuts the consumer has a right to expect in a pound of peanut butter.

■ Hot-dogs, Chinese-style, are something else again and while we've always found the folk down Hong Kong way a friendly lot, they do have some rather odd tastes in food.

Dogs and cats have long been regarded as choice table tidbits and when these aren't available they'll settle for a light snack of snakes or bear paws. It's strictly illegal to have Fido for dinner but a black market in dog meat continues to thrive.

Don't worry even if you do catch some Oriental ogling Bowser with a calculating eye. The Chinese eat only Chinese dogs and consider ours as not being sufficiently nutritious due to improper diet.

Hong Kongers also chopstick their way through 100,000 snakes in the course of a good season – something we do not intend to dwell upon the next time we order won hong foo kong with rice balls.

■ Calories, of course, are calories and whether they come from snakes or sausages they tend to show up in the same geographical areas – waistline and hips. And so there is good news for weight-watchers who also write letters. They have little to fear from licking their postage stamp. Experts report that the glue on a postage stamp contains less than two-tenths of a calorie.

But something needs to be done to improve the flavor.

■ It would be harsh and inaccurate to say that the august commission which has been inquiring into Hydro's new head office arrangements included several flea-bitten politicians – or would it? A CP report carried in several newspapers alleges that one of the lawyers was bitten by fleas 14 times on one day. Members of the commission itself also claim to have been attacked by the voracious insects.

Presence of the fleas has been accredited to stray cats which were found in the ducts of the air-conditioning system.

This is one way of putting some teeth into the law, but we are sorry to hear that so many of the proceedings have been bugged.

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Paul Page, Design Direction

Bill Flett, Design

The cover

World's largest electric induction furnace, located in Michigan steel mill, heats 30-ton steel slab to 2,300 degrees F. for hot rolling. See article on page 20.

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hydro news, volume 60, number 6

Published by Ontario Hydro, 620 University Ave., Toronto.

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Sound business judgment

idewalk superintendents can now make ut the contours of Hydro's new head ffice building rising rapidly behind a neat lack and white construction fence at ie corner of College Street and Univer- ity Avenue in Toronto. When completed ite in 1975, the 20-storey office building nd commercial centre will complement ie handsome complex of new govern- ient and university buildings within easy alking distance to the north.

Setting this project aside from other ajor construction in the downtown area the controversy which has raged over ie past several months as to the circum- tances surrounding its conception. Every spect of the construction agreement as been probed and explored during our months of intensive examination by Select Committee of the Legislature, hich was prompted by newspaper harges of irregularities.

After 50 sessions, during which 44 itnesses were heard and 7,500 pages of anscribed testimony accumulated, the ommittee summarized its findings in a 2-page report which has been copiously overed and variously interpreted by all acets of the news media. Reiteration f the points established in the study ould probably not be very useful. One oint does deserve more emphasis, erhaps, because it has not been widely cknowledged and yet is central to the oncerns of Hydro's electrical customers.

Was the agreement a good deal for the eople who pay the bills? Did Hydro live p to its responsibilities in the matter of s financial stewardship for the electrical sers of the province?

The Select Committee was unable to each a firm conclusion in this regard but ydro remains convinced of the sound- ess of the contract. (See page 29 of this agazine.) Regardless of its procedures, nd Hydro has accepted harsh criticism this respect, it holds the view that its dgment in relation to the economic and nancial aspects of the agreement will be ompletely vindicated.

Complex as the financial details may be, e basics of the agreement are easy to comprehend.

In a time of rapidly escalating costs, Hydro will enjoy a fixed rent for 30 years at a rate which is less than the current market price it now pays to accommodate more than 60 per cent of its head office staff which are now housed in outside premises in Toronto. At the end of this period, Hydro will own this first class office building at no additional cost.

That seems to make sound economic sense. It should also be realized that all the risks of escalating construction costs and interim financing are borne by the builder. Costs, of course, are continuing to rise.

And the timing was right. The financing was at eight per cent – lower than could have been obtained the year before or the year after.

Financial estimates indicate that the profitability of the project from the builder's point of view will depend mostly, if not entirely, on how successful he is in developing the retail commercial area. The contract provides that Hydro share in these profits which will, in effect, subsidize the cost of the office space. It's an arrangement where the risks are laid off against the developer.

The Committee did support Hydro's judgment on the decision to proceed on a lease-purchase basis. This met the requirement of government to avoid any further burden on the borrowing capacity of Hydro and the province at a time when capital requirements were already at record highs.

As suggested earlier, the Committee's chief criticism is directed toward Hydro's procedures in calling for competitive proposals and in judging them. In accepting this censure, Hydro points out that the procedure was new to it and there was little by way of precedent to follow in using this appoach while maintaining public confidence.

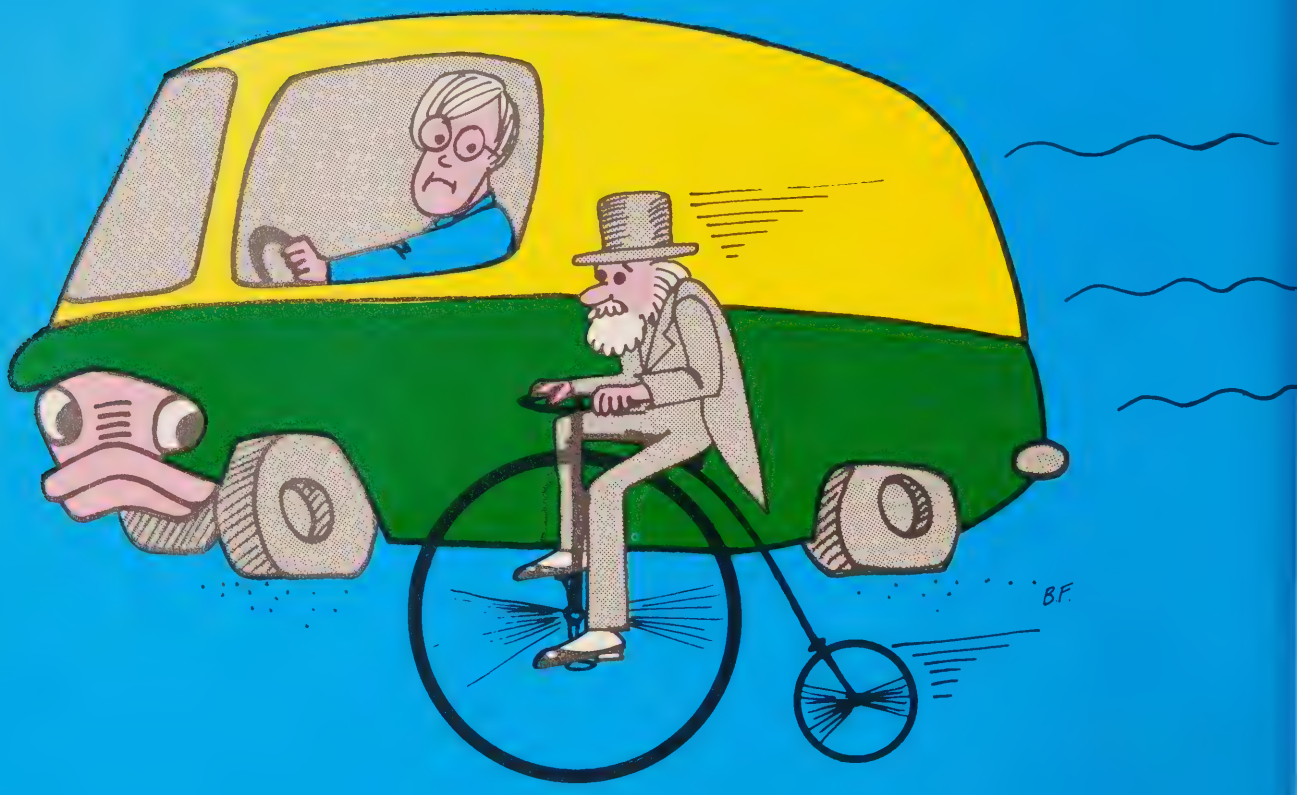
There was also some public criticism to the effect that Hydro opted for a costly and elaborate building whereas a more basic accommodation might have been more appropriate for a publicly-owned utility.

This criticism can be questioned on purely economic grounds. It is not good business to build a $10,000 house on a $30,000 lot and the Hydro building will still have a high residual value at the end of 30 years when Hydro takes over the title.

As the Select Committee reported: "The Committee is of the opinion that all persons within Hydro involved in the decision-making process were at all times of the belief that their actions were in the best interest of Ontario Hydro."

And there is good reason to believe that their actions were in the best interest of the power users of Ontario – the people who pay the bills.

Oh, for a speeding ticket...



carborough PUC wants to press its electric ehicle into regular service. But first, he problem of acceleration must be licked.

y Bill Settatree
hotos: Harry Wilson

rofessor Stuart Robertson of the Univer-ty of Toronto has one ambition these ays. That's to get a speeding ticket.

Why? Because acceleration is the major roblem Professor Robertson and his ssociates in Vehicle Research Limited ust overcome before Scarborough PUC an put a prototype electric truck into gular service.

A test drive of the truck, a modified oduction-line model, shows it has romise. But get-up-and-go is lacking.

Scarborough PUC got into the electric ehicle program early last year when rofessor Robertson and his colleagues stablished a small shop in Scarborough build a prototype electric car. The ility leased the car and placed a pur-ase order for another vehicle.

Utility manager Jim Curtis says the car ot little use because it was a two-assenger sports model. Then Vehicle esearch set to work on a van.

"What we actually did," explains Mr. urtis, "was to order a standard vehicle nd remove the internal combustion ngine. Vehicle Research installed the ectric motor and the electronic control stem for us."

Testing has been underway since April nd Mr. Curtis is enthusiastic, but cost-nscious. "I don't think our total invest-ent would add up to $10,000 in this ogram, and if it should fail we can take e electric motor out, put back the asoline engine and still have a viable hicle."

So far, the biggest hurdle appears to be celeration, although additional batteries ght help overcome the problem.

nother difficulty will be the need for a ater in winter. A propane gas heater the likely solution.

The truck runs on 24 special electric hicle batteries behind the front seat. ghts and windshield wipers are at esent operated off the standard 12-volt ttery supplied with the vehicle from factory.

The utility estimates the truck will oper-for about 3.5 cents a mile, including preciation on the batteries, maintenance and electrical consumption. The actual cost of the electricity is pegged at less than one cent a mile. Gasoline-powered vehicles cost the utility about 8.5 cents a mile to operate.

Professor Stuart Robertson . . . seeking solutions to a weighty problem.



Now for the results of the Hydro News road test .The writer took over the vehicle on Kingston Road, just east of Kennedy.

"To start her up just turn the key. It's like a light switch," said George Gordon, the utility's fleet manager, who was sitting beside me. Nothing happened. Not a sound to be heard.

"Go ahead," said George, "put her in gear and you're off."

Then I remembered. This was an electric. There's no sound when it starts. Depressing the clutch, I shifted the standard transmission into low gear and gingerly depressed the pedal.

"Give her some gas – I mean electricity. Floor it," said George.

We were off, cruising west on Kingston Road. All you could hear was a low whine, like a TTC trolley coach as the engine picked up speed. Now it was time to shift into second gear. Zero to 30 mph in 15 seconds, A trifle slow, but otherwise okay.

We swung into the right lane behind a TTC bus.

"You'd better try the brakes just so you can get used to them. They're power assisted, but they're only operated hydraulically at present," George said.

"Oh my God," exclaimed photographer Harry Wilson. He and fleet supervisor Doug Barnes were riding in the back.

The brakes worked fine, and George explained they will eventually be connected to the electrical system. We headed west on Kingston Road and pulled out into the stream of traffic. Shifting into third gear, we picked up speed to 45 miles an hour. It handled like a dream. As we approached an incline, the vehicle slowed and I had to gear down to second.

"This is the problem we have to solve. The designers think 12 more batteries will do it," George said.

After 15 minutes weaving in and out of

Writer Bill Settatree at the wheel of the Scarborough electric vehicle. At right, fleet manager George Gordon, utility manager Jim Curtis and fleet supervisor Doug Barnes examine batteries which supply the motive power. Below, an electric extension cord is connected to the vehicle's charger, ignoring the gas pumps nearby. The electric motor is located beneath the hood.





raffic I pulled over to the curb well satisied with the vehicle's potential.

For Professor Robertson, who is president of Vehicle Research, the dream of a practical electric vehicle is coming closer to reality with the Scarborough experiment.

"Our dilemma now is weight. The van weighs 7,800 pounds loaded. Its curb weight is about 6,000 pounds."

One of the major weight problems is the battery system, which employs lead-acid electric vehicle batteries capable of fast charging. Each weighs about 60 pounds and the number may be increased from 24 to as many as 36. This means the van will carry more than a ton of batteries.

"There is an engineering trade-off in design between the capability to accelerate and the weight and life of the batteries and cost of the power train," says Professor Robertson. "Accelerations in the low speed range are essential in urban driving in order to safely merge with the normal traffic flow, to turn left and to maintain speed on hills. Acceleration ability at high speeds is not a stringent requirement."

Professor Robertson says his company's research has involved two separate systems. The first car leased to Scarborough had a 10-horsepower AC industrial motor while the van has a DC motor rated at 40 horsepower. In each case, the key to the success is the controller unit, which permits use of the vehicle's standard transmission system.

Many of the problems encountered with the company's battery-driven sports car stemmed from the body design. "We had difficulty making windows, doors and other body parts fit properly," says Professor Robertson. "We also began to wonder if the sports-type commuter car was the answer or would we be better off with a vehicle for fleet users rather than individuals.

"People require vehicles for many reasons, most of them unrelated to the general needs and desires of the community as a whole," he adds. "They purchase because the initial capital cost is accept-





Streetcar with its overhead power supply contrasts sharply with the self-propelled van.



able, by force of habit, in response to promotional advertising, for status or to express their individuality.

"In most cases, the fact that the vehicle has low air and noise pollution or is less demanding on our renewable resources is not a consideration."

Professor Robertson says the capital cost of an electric vehicle is higher than an internal combustion car, but operating costs over its lifetime more than offset the initial investment.

He cites figures from a report he prepared for the federal department of industry in which a $3,000 gasoline vehicle was compared with a $4,000 electric over a five-year period. Including interest on the investment plus operating costs, maintenance, etc., the gasoline car had an operating cost of $1,835 a year compared to $1,620 for the electric.

The study, Professor Robertson says, showed electrics can compete economically with internal-combustion vehicles. For the electric utilities, there is the plus-consideration that recharging is usually done at night, levelling out peak loads and making for more economic use of electricity.

"Currently, the consumption of energy by gasoline vehicles equals about 40 per cent of our total electrical generating capability while night-time loads on generating stations are at least 40 per cent less than their daytime output. Hydro could supply a large percentage of the electric vehicle recharging load in this off-peak time."

On the international scene, electric cars and trucks are nothing new. In Britain, there are about 40,000 in use. Electrics are also being built and driven in Japan. In the early 1960's, one Toronto dairy had a fleet of 30 electric delivery trucks. They have since been replaced by internal-combustion vehicles, partly because of their age, longer delivery routes and maintenance and parts problems.

Professor Robertson is optimistic that a Canadian-built electric vehicle is not far off. His company is negotiating for the manufacture of such a car using a power train on which various body styles could be added. He also feels there's a market for conversion kits in which Detroit-built bodies could be equipped with electric power systems.

Widespread use of electrics would help conserve dwindling oil reserves and also reduce air pollution caused by the internal combustion engine – a major source of pollution in urban areas. Some pollution would result from the extra power required from fossil-fuel generating stations, but this is more easily controlled than auto emissions.

However, the primary problem in developing a practical electric vehicle remains the battery, and the recent report of the Ontario government's Advisory Committee on Energy cautions against too much optimism about an early breakthrough.

"Development of the storage capacity of batteries has not reached a point which would give the electric car long-range operational capability," the report says.

"Although attempts are being made to develop a battery which would permit a range of at least 200 miles, it is generally accepted that it will be a number of years before technology will have provided an all-electric substitute for the North American family car at a competitive price.

"The most logical first application of the electric car would be for the second or downtown car, leaving highway travel for the conventional automobile," the ACE report adds.

It's just this downtown application, with its relatively low mileages and low speeds which tantalizes the operators of large fleets of vehicles such as Scarborough PUC.

UTILITY STRUCTURE EXAMINED

William M. Hogg, of Sault Ste. Marie, chairman and president of Great Lakes Power Corp. Ltd., has been appointed chairman of a committee to develop principles and guidelines for reshaping municipal utilities in existing and proposed regional government areas.

The committee was scheduled to report its findings to Energy Minister Darcy McKeough before year-end. It is known as the "Committee on Restructuring Public Utilities."

Other members of the committee are Don Hamilton, of Aurora Hydro, representing the Ontario Municipal Electric Association; Don White, general manager of North York Hydro, representing the Association of Municipal Electrical Utilities; Grant Bainbridge, Ontario Hydro's director of consumer service; L. E. Cooke, former mayor of Barrie, representing the Association of Municipalities of Ontario; and Eric M. Fleming, of the Ontario Ministry of Treasury, Economics and Intergovernmental Affairs.

Resource personnel associated with the committee are D. B. Ireland, assistant general manager – regions and marketing, Ontario Hydro, and J. R. Picherack, Ministry of Treasury, Economics and Intergovernmental Affairs.

Premier William Davis told the Legislature last June that detailed technical studies and restructuring at the local level can get underway when the committee completes this work.

He said the government was committed to local involvement in the individual studies, which will begin as soon as the overall guidelines have been established.

Energy Minister W. Darcy McKeough has indicated time will be allowed after receipt of the report for consideration by the various groups so that final principles and guidelines can be decided. This will permit detailed technical studies at the local level to get underway in 1974.

Task Force Hydro's role and place report recommended that municipal utilities be rationalized into upper tier regional utilities where and as new municipal government is implemented. It is also suggested that the area to be served by the regional utility be the entire area served by the new municipal government.

The Premier subsequently said he was not convinced that an upper tier structure would be appropriate in every case and indicated each area should be evaluated on its merits.

Mr. Hogg served on many Hydro projects during vacations before graduating from the University of Toronto and joining Hydro full-time in 1939 as a design engineer. Between 1939 and 1957 he held senior engineering posts on the Des Joachims, Sir Adam Beck No. 2 and St. Lawrence power developments. He joined Great Lakes Power in 1957 as vice-president and chief engineer.

His father, the late William Hogg, was associated with Hydro's former construction department and his uncle, Dr. Thomas H. Hogg, who joined Hydro in 1913 as assistant hydraulic engineer, served as chairman and chief engineer between 1937 and 1947. Dr. Hogg died in 1958. □

Can electricity fill

Just before the outbreak of the Arab-Israeli war, some of the world's top energy experts attended a three-day conference on global energy supplies in London, England. Ontario Hydro Chairman George Gathercole delivered this address at the conference, which was organized by the authoritative British journal, The Financial Times.



With the need to conserve oil and natural gas, the use of electricity to heat industry and homes is almost certain to increase.

I start from the premise that people are not likely to submit willingly to restraints on their energy consumption because it relates so directly to their standard of living.

The desire of all people — including those in underdeveloped countries — to improve that standard will result in an increased demand for energy since injections of inanimate energy are fundamental to increases in economic growth, and, idealistic notions of life on desert islands notwithstanding, there is no substitute for economic growth in providing employment, physical comforts, cultural activities, leisure time and for generally promoting human well-being. High consumption of energy is not in conflict with, but is essential, to a high quality of life.

Any discussion of the world energy scene must also start from the premise of an increasingly large role for electric power. Petroleum and natural gas today supply some three-fifths of the world's energy demand, but make up a tenth of the known fossil resources. One can find various timetables for the depletion of these non-renewable resources, but it is indisputable that during the next decade or two we will be faced with the necessity of producing some monumental discoveries or finding another way to satisfy the world's appetite for energy.

One does not have to be a global energy expert to reach the conclusion that on present trends the demand for oil and natural gas is outrunning the supply and a shift in consumption patterns seems foreordained. Science may create some exotic innovation which will conquer the energy world and resolve our problems, but we must make our judgments on the basis of what we have today.

You can't solve today's problems with tomorrow's inventions. With the long lead time required for large energy projects, we must apply today's workable technology to meeting the needs of the next 10 to 20 years.

Fortunately, all the abundant alternative energy sources — waterpower, coal and uranium — which we can count on with reasonable certainty today can be used to make electricity which, more than any other form of energy, offers maximum versatility and flexibility, and is compatible with the goal of maintaining a clean and healthy environment.

Even if I were qualified to speak in any depth about the world energy scene — which I am not — I'm not prepared to take on the world's problems. I have enough of my own back home in Canada. But in my view, the rising pressure on oil and natural gas simply hastens a process already underway: a gradual but increasing transition to electric power.

An energy forecast for Canada to 1990 suggests that overall energy demands will rise 4.9 per cent a year, but electrical demands will rise much more quickly at 6.6 per cent. Another projection by the Canadian government indicates that electricity could provide about 90 per cent of Canada's energy needs by the year 2050.

In the Province of Ontario, a highly concentrated energy market because of the great degree of industrialization and material well-being, electricity generated by Ontario Hydro accounts for a little more than one-fifth of total energy consumption. This may rise to between 40 and 50 per cent by 1990. Similar trends have been forecast in other parts of the world. In the United States, for instance, electricity is expected to account for about 50 per cent of total energy demand by the end of this century.

The reasons for these startling forecasts are several. To begin with, electricity is extraordinarily versatile. It is as equally capable of operating a wide range of heavy equipment and machinery and of producing chemicals and steels as it is of energizing the most precise and refined instruments. It is absolutely essential to a

the energy gap?

modern society, whether in the home, the factory, or the farm.

Electricity is especially suited to serve the needs of heavy concentrations of people resulting from the world-wide trend to the creation of large cities. In such large centres electricity is the most feasible way of providing energy consistent with local environmental requirements.

Not only will we see dramatic new uses for electricity, but also a broadening of its application in areas where it has had relatively limited use.

Space heating — a subject of more than passing importance to most North Americans for several months of the year — is an almost certain area for expansion of electricity's use. As the need for conserving oil and natural gas becomes more pressing and nuclear power is more fully developed, the use of electricity for heating is likely to grow quickly. With future development, the heat pump could become an important catalyst in the swing to electric heating.

Electrification of mass transportation, which is well advanced in many European and Eastern countries, is becoming increasingly attractive in North America. Such electrified systems reduce not only air pollution, but also the amount of energy used per passenger mile.

It would be tedious to recount the extensive and intensive consumption of electricity in industry, commerce, and the home, but its role in getting food on the table is not so widely recognized. In many countries, electricity has revolutionized the food industry, and agriculture depends heavily upon an adequate and reliable supply. Neither should we forget the role electricity can play in maintaining a clean world: energy to recycle garbage, glass, metals and paper; to operate water purification and sewage treatment plants; to run electrostatic precipitators and other pollution control devices for industry.

What are the implications of this move to electricity?

Electric utilities throughout the world will be under relentless pressure to expand their capacity. In order to relate the total implications, I will refer frequently to the situation we are facing at Ontario Hydro, which is one of the largest utilities in North America. To meet anticipated demand, Ontario Hydro's 1970 capacity will double by 1980 and quadruple by 1990.

If this is to be accomplished, and it is a minimal requirement if Ontario is to avoid an energy shortage, we will have to build new plants, transmission lines, and transformer stations. To do so we need vast sums of capital, assured sources of primary fuels, and public acceptance of the trade-offs between the need to provide adequate amounts of energy at the time, the place, and in the form dictated by the consumer, and the interference these facilities cause to the environment.

As chairman of an electric utility which will soon be obliged to spend over $1 billion a year on new power facilities, I know that one of our most challenging problems will be raising the capital required. The problem lies in the fact that electric power systems are highly capital-intensive — even more so than other energy facilities.

To finance the electric power expansion required in my own province of 8 million people will necessitate a capital expenditure of $10 billion over the next 10 years. This is equivalent to almost 2 per cent of total Canadian domestic savings. Over the last decade, our capital needs were equivalent to about 1 per cent of total savings.

Capital requirements of the electric utilities will rise faster than the increase in generating capacity because of the higher capital cost of nuclear stations compared with that of fossil-fuel units. In the case of my own utility, I would expect that nuclear stations will be producing a large percentage of our electricity by 1990.

Besides nuclear plants, the trend towards relatively higher capital spending in our industry is being accelerated by the pressure to adopt more stringent measures to control pollution. These involve methods to improve the safety of nuclear plants, the desulphurization of emissions at coal-fired stations, more efficient electrostatic precipitators, cooling towers where waste heat presents a problem when discharged into lakes and streams, and the undergrounding of transmission lines.

As world dependence on electricity increases, the financing of new generating, transmission and distribution facilities could impose increasing strains on the world's capital markets, necessitating more internal financing with higher electricity rates.

The shift to electricity will place tremendous demands upon the electrical industry in the years ahead. Can the industry cope with them?

Looking at the situation realistically, it must be recognized there is a danger that sudden surges in electricity use could temporarily overtax the industry's ability to keep pace. Steep increases in oil prices or a brief shortfall in oil supplies could well precipitate a sudden increase in demands for electric heating.

It is estimated that if just 10 per cent of the oil- and gas-heating load in the United States were switched to the electrical systems, residential power demands would increase 50 per cent. If there were a sudden swing to the electric car, the effect on the electrical industry would be dramatic.

The question of how to facilitate a smooth changeover from a predominantly oil and gas energy base to a predominantly electric one must be given high priority by those responsible for planning future energy policy.

Control of pollution places a particularly heavy social, technical and financial burden upon the electric utility industry. Even though the increasing use of electricity in place of other forms of energy will reduce urban air pollution problems and result in a net environmental gain, it poses some environmental problems of its own which have yet to be effectively overcome.

One is the disposal of waste heat. Due to inefficiencies in the energy conversion processes, 60 per cent of the heat from

fossil-fuel generating stations — more in the case of nuclear stations — is dissipated into the air and water. This may or may not pose an environmental problem, depending on climate and the availability of bodies of water large enough to absorb the heat without harmful effects.

In Ontario, where our large generating stations are located on the shores of the Great Lakes, about the most noticeable effect is that fishing in the vicinity of the stations has improved — much to the delight of local anglers. In some regions, on the other hand, large fish kills have been reported.

There is some scope for reducing waste heat from generating stations by improving the efficiency of converting fuel into electricity. The greater challenge is to find means of putting the waste heat to effective use.

Coal is the most abundant fossil-fuel in the world. To make it environmentally acceptable for generating electricity, increasing attention must be devoted to controlling and reducing air pollution. Particulate emissions can be controlled by installing electrostatic precipitators which remove up to 99.5 per cent of the solid pollutants. Concentrations of gaseous pollutants at ground-level, where environmental damage occurs, can be reduced by burning low-sulphur coal, if obtainable.

Unfortunately, most coal within economic distance of population centres has a high sulphur content. Furthermore, low-sulphur coal reduces the efficiency of electrostatic precipitators and aggravates the particulate problem. In the case of sulphur dioxide, the solution is not yet in sight, but considerable research and development are being devoted to this problem and progress is being made. If I were to make a guess, I would say that we will have SO_2 removal systems suitable for large generating units by the middle of the 1980's.

In the case of nuclear stations, public concern has been aroused in some areas about the environmental dangers of radiation. The evidence is overwhelming, however, that the dangers are more apparent than real. The minute quantities of radiation that do escape from nuclear stations are indistinguishable from background sources such as the sun and rocks.

The continuing efforts by the nuclear industry to minimize radiation emissions and to develop even more effective methods of storing radioactive wastes should take care of any environmental risks and the industry's continuing unparalleled safety record should allay public fears.

Hydro-electric power will continue to play an important, but diminishing, role relative to total energy consumption. The Province of Ontario again provides me with an illustration. A dozen years ago 99 per cent of the electricity generated by Ontario Hydro was produced from water power. By 1970, fossil-fuel generation made up one-half our resources. By 1980, nuclear energy will be the dominant element in our system and will increase its share from there.

While nuclear energy and coal seem to be the likely primary sources of electricity in the short term, alternative forms will receive increasing attention as technology develops. Fusion and solar energy possess a huge potential.

I believe the technical, financial and environmental problems associated with using electricity to fill the energy gap can be solved. However, Ontario Hydro's experience in building new stations and lines in recent years causes me concern on a more intangible obstacle. Perhaps I could call it the people problem.

It is a problem faced by energy suppliers to varying degrees in countries which have reached a relatively comfortable state of industrialization and affluence. It is not found to the same extent in the developing countries.

But much as we may long for the good old days when people declared a holiday for the arrival of electricity in town, we have to respond to new attitudes if we are to successfully fulfil our responsibilities. It is a real concern to many utilities in North America.

Transmission lines are particularly difficult because many people object to their appearance, especially in urban and scenic areas. With further development, however, it will be possible to bury these lines for reasonable distances in environmentally-sensitive areas. In the meantime, much can be done to make the lines and their rights-of-way more attractive and to reduce the number of new lines by increasing their power-carrying capacity.

Sites for new power stations also present problems, but none resembling the frightful picture drawn by some environmentalists of almost unbroken lines of power stations along the banks of rivers, bays and lakes. My own utility now has over 70 generating stations in service and under construction, but by building new units in larger sizes and more than one station at the same location, we expect to minimize the number of new sites we need.

In North America, people opposed to the construction of power facilities have frustrated the plans of many utilities and power shortages have occurred as a direct result. There is a growing discrepancy between what people expect and what is technically feasible for utilities to produce. People clamor for the adoption of techniques and equipment that have no hope of success.

Without detracting from the salutary effect of this prodding — and all utilities and industry are the better for it — there is little doubt that much of this effort is misdirected and self-defeating. It often undermines the ability of the utility to meet electrical needs, or forces the adoption of alternatives that are more environmentally harmful than the original proposal. With demand for electricity in the industrialized nations doubling roughly every 10 years and with large, modern generating stations taking up to 10 years and longer to design and build, power shortages are likely to become more widespread and to take longer to correct.

I hardly need tell this audience that dependence upon electricity today is so

complete that a failure to meet demand even for a short period causes great inconvenience and hardship. Curtailment of service for prolonged periods would cause economic and social chaos.

It is perhaps unfortunate that the results of delays in energy projects are not more immediate. The anger of environmentalists can be nothing to the wrath of a public deprived of the electricity it needs.

The task facing utilities, regulatory agencies, government, and the community at large, is to find a more effective means of resolving disputes over the location of generating stations and lines so that power shortages can be avoided.

In the face of concern about energy scarcity, it is ironic that one of our major jobs is to convince the public that more electricity is necessary so that we can gain acceptance of new facilities. It is particularly ironic in North America, where energy has been such a basic ingredient of the high level of prosperity and well-being enjoyed.

In part, the problem is psychological. Some people in Canada and the United States have become hypnotized by the image of North Americans as profligate and frivolous consumers of a premium energy, with homes full of electrical gadgets. It is true that on a per capita basis, Canada is the world's second largest consumer of electric energy, but this is not because we open tins with an electric canopener or cut the grass with an electric mower.

Climate has a great deal to do with energy consumption in my country. One quarter of all the energy we consume is used simply to keep warm in the winter. As for electricity, close to half of the consumption in Ontario is by industry, about one-quarter by commercial consumers, and another quarter is residential, which includes farms and street lighting.

I do not deny that in past decades Canadians tended to regard electric energy as almost as cheap and abundant as the air and with reason, because it was. But that day is passing. Many electrical utilities, my own included, have modified or suspended promotional advertising and are now stressing the wise use and conservation of electricity.

Unfortunately, this inaccurate conception of North America as a kind of all-electric Roman Empire in a state of decline and fall has been used as the focal point of efforts by some groups in attempting to rally public support and block essential expansion of electric utility systems.

Let's have zero growth, they say, we've got all the power we need, we want no more power plants or lines. The concerns of environmental groups are legitimate, but their perception of the role and future need for electric energy is faulty. Hostility to new energy sources has not reached the same level in Canada as in the United States, where the physical ability of some utilities to supply peak loads has been impaired, to the discomfort of their customers. It is, however, a growing and significant problem which must be solved if electricity is, indeed, to fill the energy gap.

Delays in getting action, dealing with environmental groups, earning public support: these are tough, puzzling issues, and most of the utility people I know are looking for answers. I don't have them, although we are trying some new approaches of public participation in open planning which we hope will be fruitful.

I believe one beneficial result of the attention now being given to the so-called energy crisis will be a much greater degree of co-ordination of the various energy suppliers. My own province is now in the process of developing an integrated and balanced energy policy. We will get nowhere in solving the basic problems as long as everyone is running about trying to fill gaps. There must be a co-ordinated approach to energy — regionally, nationally, and eventually internationally.

This, it seems to me, is inevitable, and whether we like it or not, governments at all levels will increasingly concern themselves in the planning and regulation of energy supply.

To summarize my conclusions:

- With world demand exerting heavy pressure on oil and gas supplies, there will be a shift in the pattern of energy consumption to electricity. Energy consumption will continue to rise at a higher rate than population, and electricity's share of total energy use will expand substantially.
- Increasing competition for available fuel reserves will push prices higher and threaten security of supply.
- Energy policy planners must give high priority to achieving a smooth transition from a predominantly oil and energy base to a predominantly electric one.
- All factors considered, electricity is the form of energy most compatible with the environment, but one of the major challenges to electric utilities in filling the gap — in some countries, at least — is finding a means of dealing with increasing opposition to new energy projects.
- A highly co-ordinated approach to energy is essential, and government will play an increasingly greater role in achieving that co-ordination.

Electricity can, and in my view will, fill the energy gap. In the short run it provides a means of using the vast coal resources of the world. But more particularly, and by unlocking the door to nuclear fission, and one day to nuclear fusion and solar energy, electricity can free the world from the calamitous consequences of falling reserves of fossil-fuels. □

Towers and Trees

The Gatineau transmission line crosses the Don Valley just about where the Metropolitan Toronto boroughs of North and East York meet.

And on summer evenings, the kids from Flemingdon Park, an apartment city within a city, play softball and soccer on the soft green grass between the steel towers leading to nearby Leaside transformer station.

The children are in a league operated by North York's parks and recreation department and playing organized sport beneath the high-voltage lines is somewhat of a departure. But it's right in line with a new right-of-way policy adopted by Ontario Hydro.

Gone are the "no trespassing" signs and all that remains are the standard warning notices cautioning potential climbers of the imminent danger overhead.

For more than 60 years, transmission towers and rights-of-way have symbolized Ontario's growing prosperity. Once, the towers were a welcome sign. Today, even though they're using more electricity, many people object to transmission lines running through their neighborhood.

The actions of various protest groups have already resulted in delays in the construction of new transmission lines. Indeed, the problem has become so acute there's a danger that an extra high voltage transmission system planned to carry power from nuclear and fossil-fuel generating stations now under construction in Southern Ontario will not be ready on time, leaving generating equipment idle to the tune of thousands of dollars a day and resulting in power shortages.

Hydro has responded to the objections along three broad fronts. Firstly, it is encouraging the public to participate in the decision-making process for all new transmission line routes. This involves a large number of public meetings in the various study areas, intensive research and a constant two-way flow of information.

Secondly, a program is under way to make both rights-of-way and transmission towers as unobtrusive as possible by the introduction of new designs and landscape techniques.

Thirdly, rights-of-way are being opened up to other uses so that the land beneath the towers can be used more productively.

Under the new rights-of-way policy, trees, shrubs, and a variety of cover crops are being used to soften the visual effects of transmission lines. One will still see the towers, but they'll stand together in peaceful co-existence with trees and shrubs.

No longer will virtually everything in the path of a transmission line be cut down. Instead, rights-of-way will be selectively cut, which means that only trees interfering with construction or the safe operation of a line will be removed.

One of the best examples of the new selective-cutting technique is in Eastern Ontario on a new stretch of high-voltage line which runs between the Kingston area and Lennox generating station, under construction at Bath.

Tree screens have been left at all road crossings and the only reason Hydro's foresters have trimmed trees along the route is to ensure they meet regulations as to the clearance between their tops and the conductors. Only trees that would interfere with maintenance or safe operation of the line were removed.

In areas where there is insufficient vegetation to screen the right-of-way, trees will be planted. Open areas will be seeded with suitable ground cover to lessen the visual impact, reduce the possibility of soil erosion and provide shelter for wildlife.

Bob Richmond, Georgian Bay region forestry superintendent, says: "Clear-cutting is a thing of the past."

Mr. Richmond oversaw the clearing of the right-of-way for the second of two extra-high-voltage lines running between Kleinburg and Parry Sound. The contrast is clearly visible between the old and new rights-of-way.

In addition to leaving trees standing on new rights-of-way, Hydro is prepared to reforest an acre of land with seedlings for every acre selectively cut in townships where less than 15 per cent of the farm area is in woodlot.

Although the trees will not hide tall towers from the public view, they will provide a pleasing focal point for the eye. One conceptual plan for a transmission line route shows a blend of trees of various heights and species, shrubs and ground cover. On the borders stand tall trees, tapering in size toward the centre where shrubs and ground cover permit access to the towers for maintenance work.

The ground cover – a mixture of shrubs, grasses and legumes – will help check undesirable woody growth, prevent soil erosion and stream sedimentation and provide a habitat for wildlife. The intent is to enhance the "forest edge" effect which will provide shelter and food for deer, small game, grouse and other birds.

This type of biological control is already paying dividends. For example, the right-of-way between the 4,000,000-kilowatt Nanticoke generating station on Lake Erie, near Port Dover, and Middleport transformer station was seeded with timothy, brome grass and bird's-foot trefoil in the spring of 1971. Since then, the field mouse population in the area has increased – the mice will get rid of woody vegetation that the grass fails to smother. Hydro foresters say that cover, or smother crop, seeding will help to reduce herbicide spraying.

When spraying is necessary, trained and licensed Hydro arborists do the work to the rigid specifications laid down in provincial and federal legislation.

Grass has taken root in some of the most rugged territory in Ontario following the aerial seeding of a 60-mile section of right-of-way between Marathon and the University River in April, 1972. Other seeding operations have taken place between Sudbury and Elliot Lake, around Parry Sound and Barrie and along the power corridor between North Bay and the recently completed Lower Notch generating station on the Montreal River.

Yet another experiment in biological control may help reduce the soaring price

do mix

Trees, shrubs and a variety of cover crops are being used to soften the visual effects of transmission lines. And many municipalities are turning the space beneath the lines into much needed parkland.

by Rae Hopkins







Mechanical tree spade moves a 15-foot tree on to the right-of-way where it will help to screen base of the steel towers. In the lower photo, Hydro forestry crews adjust guy wires and tamp the soil around the base of replanted trees.

of honey. Hydro will join forces with the University of Guelph next spring to establish black locust orchards on rights-of-way near Cambridge and between Nanticoke and Middleport in an effort to stabilize the bee population.

"Because farmers have stopped growing sweet clover and alfalfa in favor of corn, the bees have disappeared from the Niagara fruit belt," says forester Earl Gillespie. "That disappearance has reflected on the price of both fresh fruit and honey, which is now in short supply."

Mr. Gillespie says University of Guelph estimates show that with the right kind of black locust – some species flower all summer – annual honey yields could reach $1,500 an acre.

Some existing rights-of-way, including the original extra high voltage line, are being improved by the planting of trees, some of them up to 15 feet high. At the same time, thousands of seedlings are being planted along river banks to control erosion and thousands more planted in holding areas near generating and transformer stations for future use along power corridors.

Foresters attempt to determine what species will thrive along the right-of-way and try to maintain a proper balance of native species. Some trees are moved in from just off the right-of-way; others are acquired from local nurseries or the Ministry of Natural Resources. Hydro has budgeted $1 million for right-of-way upgrading for 1973-74, of which the yeoman's share will be spent on screening road crossings in both urban and rural areas.

But the new rights-of-way policy goes further than landscaping. Hydro wants parks on its power corridors and is prepared to make land suitable for park development available to municipalities for $1 a year. The land will be leased for a specific period up to 25 years – and in the unlikely event that Hydro will require it back, municipalities will be reimbursed fully for capital expenditures on the park.

John Murchison, a landscape architect in Hydro's forestry department, suggests that power corridors are particularly suited to public parks. Until the recent policy change, though, municipalities had shown little interest because of shorter-term leases, the risk that parkland investments might be lost and rental payments to Hydro.

Under the new policy, Hydro asks for no relief of taxes or grants. Anti-climbing barriers or other safety features that may be necessary will be provided by Hydro at its own expense.

Expertise is available through Hydro's landscape architects to assist municipalities in planning rights-of-way parks, even to the point of total integration with the municipal parkway system.

Mr. Murchison defines two types of park: active, which includes facilities for spectator sports, and passive, which is intended mainly for children or strollers. Power corridors are suited to either type, he says, and Hydro's landscape architects are prepared to advise on the park most suited to a particular location and to assist in the design and planning.

In designing a park, Mr. Murchison says, landscape architects must take into account the impact it will have on the neighborhood. For example, a park drawing up to 600 people into a small neighborhood could cause serious disruption to area residents. Another consideration is accessibility, both for pedestrians and vehicles.

Part of the planning assistance offered by Hydro's landscape architects is a site analysis which includes a community profile to determine what the people in a particular neighborhood are like, whether they want a park in their area, whether a park is desirable, and what type it should be.

"There's no point in putting a bowling green in an Italian community when, in fact, they want a bocce court," Mr. Murchison points out.

Many municipalities have expressed interest in the parks scheme. Says North York's deputy commissioner of parks and recreation, Gordon C. Hutchinson: "I think municipalities generally welcome the opportunity to work with Hydro in the planning of additional recreational facilities. The ability to use these tracts of land makes its possible to augment the facilities we already have and will go a long way to keeping the kids off the street and getting them into properly supervised and organized recreational activity."

The kids from Flemingdon Park are a perfect example. □

Wilderness undistu

A family of mallard ducks and a graceful trumpeter swan floated lazily on the cool waters of a marsh bordering Lake Ontario at Pickering nuclear power station. They were watched by a group of picnickers in a park nearby.

On that same afternoon, a nine-year-old boy sat on a long wooden pier at the west side of the outflow channel at Lakeview generating station fishing for coho salmon.

Marsh, park and fishing pier are all part of a continuing program to enhance the area around Ontario's generating stations. The program goes hand-in-glove with a recently announced right-of-way policy which encourages the use of power corridors by municipalities for park development.

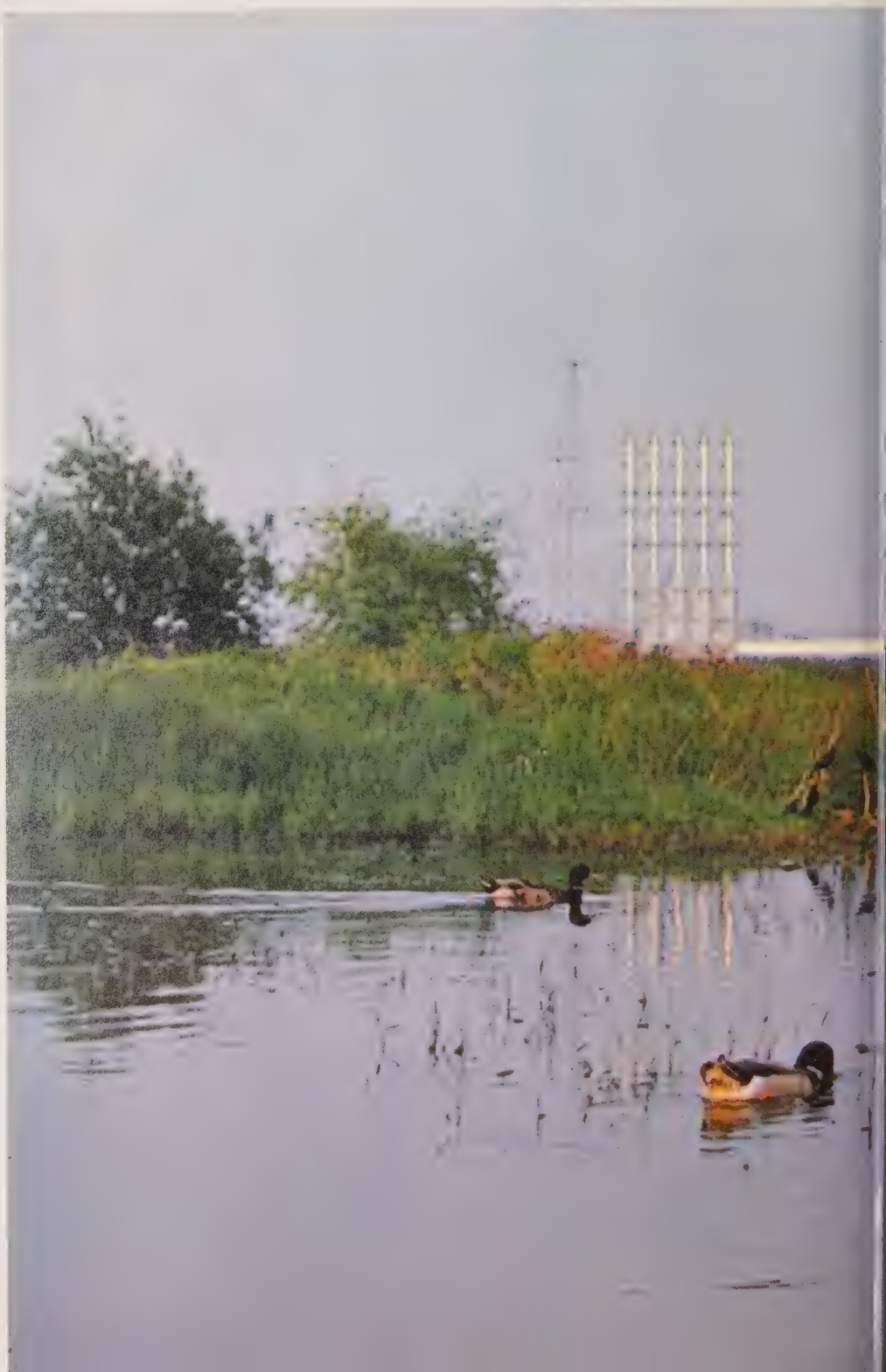
The new Pickering park bordering the marsh was once a storage compound for construction materials and thousands of cubic yards of excavated earth and rock. Now the earth has been moulded into gently sloping hills, seeded, criss-crossed with gravel walkways leading to scenic lookouts and planted with about 2,000 trees. Brightly colored orange-and-black picnic tables are scattered throughout the 28 acres of hilly parkland. The marsh is retained in its natural state.

Ontario Hydro laid out the park to the specifications of a firm of landscape consultants, then turned over its operation to the Metropolitan Toronto Region Conservation Authority.

In summer, the park will be available to visitors who wish to picnic or relax in the sun. In winter, the hills will be converted into toboggan and sleigh runs with mini ski slopes for novices. Another section of Hydro property has been taken over by Pickering Township's recreation department and a floodlit tennis court developed.

R. R. Booth, a senior project design architect with Hydro, says one of the prime considerations at the Pickering site was to retain the marsh in its natural state.

"We've asked both township and conservation authorities for co-operation in maintaining the water course integrity in the area to ensure that no fill, oil or garbage dumping – or anything else that



bed in a nuclear age





could interfere with the delicate ecological balance of the marshland – is permitted."

Mr. Booth says that Hydro's landscape architects have developed master plans for park development around all new stations. "We try to get in at the beginning of station planning to co-ordinate the orderly development of the site. Every station has a completely different set of problems, but we hope to retain a greenbelt area around each new plant."

Another park is being developed on a 40-acre site at the Lennox oil-fired plant, under construction on Lake Ontario near Bath. The park will eventually be turned over to the Ministry of Natural Resources.

Because of the historic significance of the Bath area – it was settled by United Empire Loyalists as early as 1784 and became a major shipbuilding and carriage manufacturing centre – local historical societies, conservation groups, the Quinte Parkway Association and a number of other organizations were asked for their suggestions in regard to the park and the surrounding area. The major recommendation was that the actual waterfront, off which a British frigate successfully evaded the American fleet during the war of 1812, should be left in its natural state.

At the Nanticoke coal-burning station on Lake Erie, huge mounds of earth scraped out of the intake and outflow channels and wet ash storage lagoon have been tapered into gently sloping hills to provide a recreation area for the community. Additional landscaping and contouring have improved the look of the lagoon itself.

And grounds at the Lambton coal-fired plant, near Sarnia, have been neatly groomed and the St. Clair River shoreline improved and turned over to the Ministry of Transportation and Communications for the development of a parkette for motorists on the scenic Bluewater Highway. The beautification prompted a letter of appreciation from the St. Clair Parkway Commission.

At the Bruce Nuclear Power Development on Lake Huron, neighboring Inverhuron Park will be closed to campers after 1974 to meet regulations associated with the use of hydrogen sulphide gas at the development's heavy water plant.

The 550-acre park will be replaced by an 1,800-acre park to be established at MacGregor Point, a few miles to the north. Funds received from Hydro for the purchase of Inverhuron Park will be used to finance the development of MacGregor Point. Until MacGregor Point is operational, campers will be able to stay at Inverhuron. It is intended to keep the beach and picnic area open free of charge to day visitors even when Inverhuron is closed to overnight camping.

In spite of the recent proliferation of generating station parks, the development of park facilities in association with major power projects is nothing new. The entire St. Lawrence parkway belt resulted from the construction of the Robert H. Saunder – St. Lawrence generating station and Seaway development in the fifties. And it was the $12 million-plus in water rentals paid over the years by Ontario Hydro to the Niagara Parks Commission that was mainly responsible for the development o the extensive Niagara parks system.

As for the floral clock next to the Sir Adam Beck-Niagara plants at Queenston it was designed and built by Ontario Hydro staff in 1950.

The clock, which contains more than 24,000 plants, is a major attraction for more than half a million visitors a year.



Whether visiting the floral clock at the Sir Adam Beck - Niagara installations, trying for coho salmon off the Lakeview generating station or picnicking in a new park at Pickering nuclear power station, the public is being encouraged to enjoy the areas surrounding some of Hydro's major generating plants.



INTRODUCING...

Coke-fed cupolas are giving way to modern electric induction furnaces to curb metal losses, reduce pollution and beat the competition.

by Bob Morrow

Caught in a web of interrelated problems, the operator of a small Western Ontario foundry has decided to switch from his outdated coke-fed cupola to electric induction melting. In so doing he is solving some vexing problems and moving onto a new technological plateau.

Others in the metal-working industry today share his problems: stricter air pollution regulations, rising prices and possible scarcities of coking coal and metals, shortages of skilled labor, and intense competition.

In addition, the demand for metal castings has increased to the point where many foundries require greater plant capacity and for various reasons customers are demanding higher quality products.

For instance, many Ontario foundries supply parts for the booming automotive industry, which is being hard pressed to improve car safety. "The failure of a wheel spindle on a car can result in more than an unhappy customer," says a U.S. expert on induction heating. "There can be an accident or a lawsuit."

The non-ferrous foundryman is concerned, too, about costly loss of metal in his present operation – losses which irk the neighbors as well as the air pollution authorities – and the metals industry is looking for ways to recycle more scrap into useable products. Induction heating will allow him to save metal and use scrap exclusively.

"Induction heating isn't the only answer for the foundryman," says Roy Durham, an Ontario Hydro specialist in industrial applications of electricity. "But when all costs are considered, often it's the cheapest and most effective way to do the job."

The Western Ontario foundryman decided to go electric after studying a 15-page cost analysis prepared on behalf of the local Public Utilities Commission by Hydro specialists on electric induction melting. The in-depth study calculated electric energy costs per ton of output which were cheaper than the coke-cupola operation. "This turns out to be so in many cases," said Mr. Durham.

The contrast between a cupola and an electric foundry is striking. In a cupola, a small furnace for melting metals, the foundryman mixes pig iron, metal scrap, limestone and other ingredients. It's an ancient art. The cupola is usually fired with coke which has soared in price from $35 to about $65 a ton since 1961.

When the cupola is dumped, the material is quenched with water and vast amounts of smoke, fumes, dust and metal particles are given off in a spectacular display. This represents waste, air pollution, and working conditions that resemble Dante's Inferno.

An electric foundry is a cleaner, self-contained and precisely-controlled operation. Air pollution problems aren't completely solved by use of induction melting but they are greatly minimized, says Mr. Durham. Besides, induction heating lends itself more readily to using existing foundry space and to automated operations.

An induction furnace is an electric furnace heated by a current which is caused to flow through the metal charge by electromagnetic induction. There are two types – coreless and channel furnaces.

In a coreless furnace, the metal to be treated becomes the core of the furnace which is surrounded by coils of wire similar to the windings around a magnet in a motor or transformer. An alternating current passed through the coils induces an opposing current in the metal charge. This produces enough heat to melt the charge.

The channel type is similar to a transformer where the molten metal is a short-circuited secondary loop. Channel furnaces are ideal for holding and superheating molten metal from some other type of melting unit such as a cupola or coreless induction furnace. With higher ratings they can be used for primary melting.

Both types have advantages for certain foundry operations and sometimes they are used in tandem. They also share some important features.

Interaction of the electric fields produces a powerful stirring action in the melt, particularly in a coreless furnace, which thoroughly mixes the ingredients. This ensures each melt is homogeneous and changes in the composition can be readily and quickly made. The turbulence permits use of a wide range of materials, including cheap scrap borings and turnings, with minimum loss of expensive alloys or metal particles.

Accurate temperature control averts overheating of metals and the resultant waste of metal and fuel. A big plus in many induction melting operations is the ability to reproduce products of consistent quality.

Induction melting is widely used in the U.S. and Britain, and is gaining ground in Ontario where coreless and channel furnaces are manufactured for the domestic and export markets. Canadian-made furnaces have been sold to Turkey, Zambia and Australia.

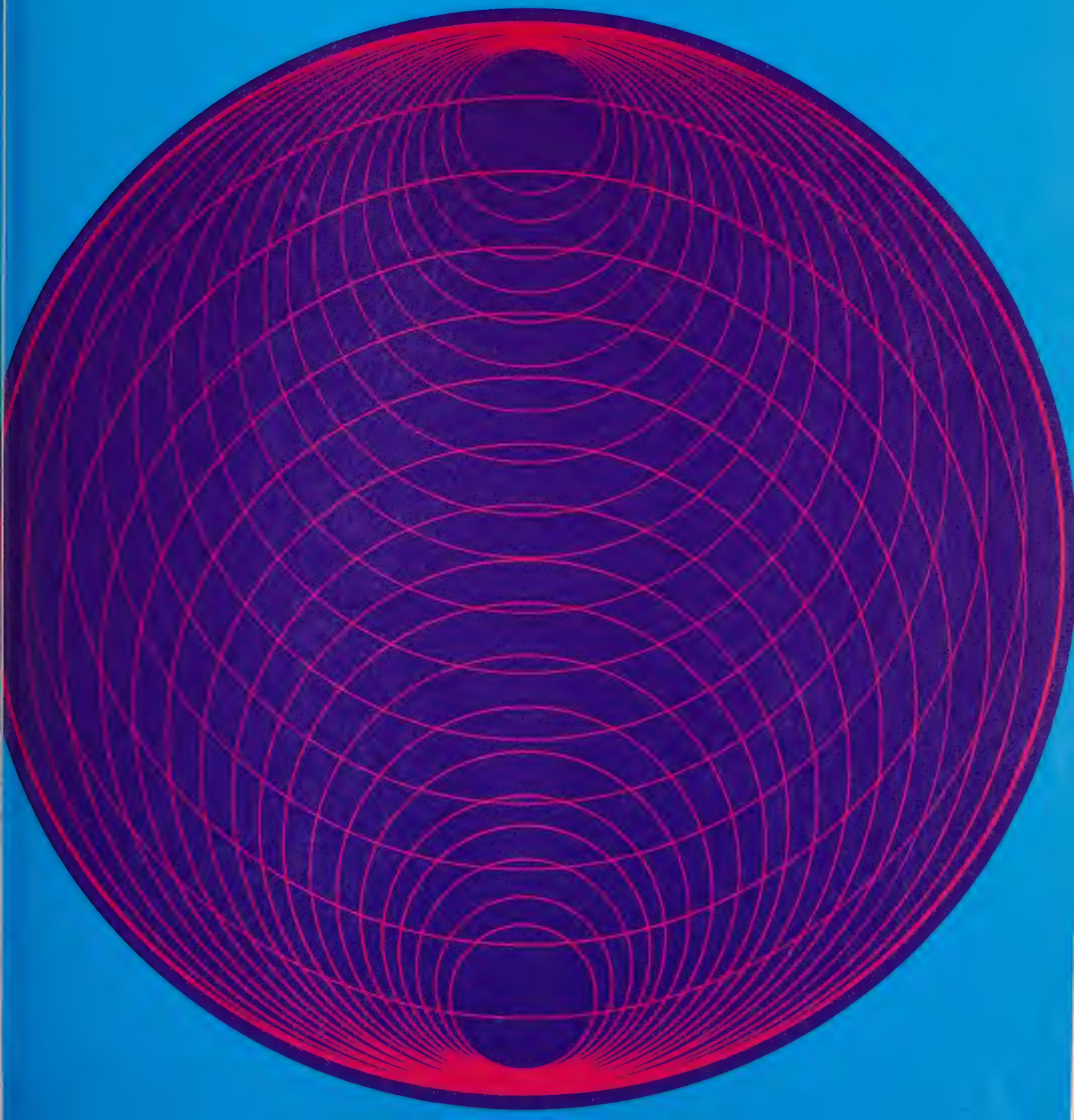
There's also a marked swing toward use of electricity in Ontario iron foundries which between 1964 and 1968 increased their shipments by over 50 per cent to $137 million. In this period their electricity consumption increased 250 per cent while gas consumption increased over 300 per cent.

Indeed, primary metal manufacturing is a big business in Ontario with great potential. In 1969, value for all minerals produced in the province was $1,217 billion, including copper, nickel, iron ore and zinc. There are more than 2,400 plants, consisting of 200 primary metal industries, 1,570 firms in the motor vehicle and accessories business, 363 machinery industries and 290 in the transportation industry.

Many foundries are scattered across Ontario in small towns and cities where you would hardly expect to find industry. Often they are suppliers to the automobile industry and have experienced a remarkable spurt of business due to the U.S.-Canada auto pact under which some U.S. models are manufactured here for export.

Many other induction applications exist in the general field of metal heating,

THE INDUCTION FURNACE



welding, brazing, soldering, surface and through hardening, and heating for forging and extruding.

One of the advantages is that heat is generated only in the workpiece. Heating can be very rapid and restricted to several areas along the workpiece length. This helps, for example, in applying heat to harden a metal part in an assembly line operation.

Interest in induction melting and heating may be gauged by the fact that about 200 representatives of the metal-working industry attended a Hydro-sponsored "inductioneering" conference last fall in Hamilton. The conference brought together manufacturers and users of equipment to compare notes on induction melting and heating techniques and applications.

Bev. Robinson, another Hydro industrial specialist, explained to the conference how industries using electric induction processes can limit their peak demands and energy costs by peak demand control. By timing industrial applications, induction units can be used off-peak at lower cost. This reduces the ultimate cost per pound of the manufactured product and the amount of equipment needed by utilities for generation, transmission and distribution to meet this demand. For instance, if an industry's peak demand occurs around noon certain loads (such as hot water tanks or baking ovens) can be shut down for that period. The result is lower average unit energy costs.

Several examples show the versatility of induction heating in various applications:

- *Canadian General Electric uses induction heating in a vacuum chamber to braze wear and spacer pads onto the thin tubes used to make up fuel bundles for Canadian nuclear stations. In a mass production technique, 14 tubes at a time are heated at 1060°C to complete the braze. An estimated 3,000,000 individual brazes were required to produce 20,000 bundles for Pickering's first four reactors.*
- *Canadian Westinghouse in Port Hope has developed an induction operation for annealing (strengthening and tempering) calandria tubes for nuclear reactors at 1350°C. The 20-foot long tube travels through a vacuum chamber surrounded by an induction coil at a rate which completes the operation in three minutes.*
- *Thompson Products in St. Catharines uses induction heating exclusively to heat slugs to forge valves in its forge shop. One of the advantages is the ability to use induction heating to heat local areas along the slug to shape the valve. Four of the Thompson units have been in use since the Second World War when they were used for heat-treating the noses of armor-piercing shells.*
- *Crowe Foundry Limited at Hespeler uses a 30-ton channel melter to pour 40-45 tons of gray iron over three shifts, if necessary. The foundry makes castings to serve the automotive, agricultural and electrical industries and does general jobbing at a cost less than other melters.*
- *Anaconda Canada Ltd., a major supplier of copper and brass mill products, has a casting station consisting of two 800-kilowatt induction furnaces for melting brass and a 450-kilowatt induction holding furnace. The holder feeds a semi-continuous casting machine to simultaneously produce two cakes that can weigh up to 10,000 pounds each. The same shop has two older induction melting stations, each consisting of a 450-kW melter and a 450-kW holder.*

Besides savings in foundry space and labor, such induction furnaces reduce costs by curbing metal losses which occur in conventional heating processes. Zinc losses, for example, can be substantial in the production of brass which is a copper-zinc alloy. And zinc costs nearly $600 a ton.

One manufacturer estimates five per cent of the brass is lost when gas-, oil- or coke-fired furnaces are used. In a plant which produces 6.25 million pounds of brass a year, losses could amount to $50,000 in material alone. Anaconda says, however, its metal losses are running about one per cent a year.

The trend is to larger and higher powered induction furnaces. The largest in the world, installed in a Michigan steel plant, uses 210 megawatts. Steel slabs weighing 30 tons are heated inductively to 2,300 degrees F. for rolling. This operation has created widespread interest in the view of the development of mini-steel mills in the U.S. to compete with the large steel makers.

As for recycling, Dr. H. B. Osborn, Jr., vice-president of Park Ohio Industries, has suggested induction heating to handle massive volumes of scrap, such as junked cars and turnings and boring from machining components. Junked cars, which are contaminated with other materials, can be compacted into round billets 10 to 12 inches in diameter, heated by induction and extruded into bar or wire for such uses as reinforcing bars and similar products. Turnings and borings of known composition can be changed directly into sheet metal for use in making new auto bodies, he says.

For drying, curing or bonding non-metallic finishes, induction heating again shows its versatility. Conventional drying methods include extremely large hot-air ovens heated by electricity or fossil fuels, or direct heating by infrared. Since induction heating raises the temperature of metal rapidly, the space required for the operation can be substantially reduced: a 10-foot induction unit can, in fact, replace a 120-foot oven.

Ontario Hydro estimates that within the next 10 years requirements for induction and electric arc furnaces in Ontario may reach 1,000,000 kilowatts. This is hardly surprising and may indeed be rather conservative in view of forecasts for other parts of the world.

Hydro's efforts to inform foundrymen of the advantages of electric induction processes are viewed by Roy Durham as a service in helping people to make decisions for more efficient, economical and effective use of electricity.



ll-electric foundry in Brantford has three coreless induction furnaces, which offer dvantages in controlling costs, product quality and pollution.

"If we believe that a process can be one more efficiently and economically using another fuel, we will tell the customer," said Mr. Durham. "It is not our urpose to urge unrestrained expansion the use of electricity. We seek only develop use of electricity in a rational ay to derive the maximum economic and cial benefit from the facilities required sustain and increase Ontario's osperity."

Dramatic impact of new uses.

"Manufacturing industries are expected to experience the most dramatic impact from new uses of electricity." That's the view of the U.S. Federal Power Commission contained in a report which has significant implications for Canadian firms, particularly in metalworking and allied industries.

In its 20-year national power survey, which projects electric energy requirements to 1990, the commission said new developments in solid-state technology have made possible a silicon rectifier which can help to introduce new economies in rolling mill operations and in fabricating techniques calling for precise control of local applications. Rectifiers convert alternating current into direct current for industrial use.

"The load potential of process heating is expected to be greater than that of industrial lighting and industrial (motor) drives which revolutionized manufacturing industries in the past," says the report.

The report says the U.S. steel industry appears to be "on the verge of a revolution in the steel-making process" in which more extensive use will be made of electric-arc furnaces. Industry analysts predict that about 100 million tons, or about 50 per cent of the total annual U.S. raw steel output, will be produced in electric-arc furnaces by 1990.

"The steel industry is anticipating large-scale production and wide availability of prereduced ore during the 1970's, followed by a rapid replacement of open hearth processes by the electric-arc furnace," says the FPC. Prereduced ore, a metallized sponge iron of 85 to 98 per cent purity, as well as scrap metal, are "excellent charges" for the electric-arc furnace.

As for electric induction heating in the steel industry, the report says that such processes as reheating steel slabs prior to hot rolling could be responsible for two-thirds of the 150 million tons a year in projected U.S. output by 1990.

OMEA votes on finance plan

Ballot box at nine district meetings



Delegates to the District 2 OMEA meeting at the Elgin House were the first to vote by ballot on the issues of capital contribution and return on equity.

Representatives of 353 municipal electric utilities voted on two important financial issues at nine district OMEA meetings in September and October.

The proposals, made by the OMEA's power costing committee, involve:

– Specific increases in the wholesale cost of power to reduce Ontario Hydro's borrowing requirements for system expansion and to protect its financial position.

– Phasing out over a period of four to eight years the practice of paying a "return on equity" to municipal utilities.

The new "capital contribution", also referred to as a system expansion charge, was approved in principle by the OMEA convention in Toronto last March. A detailed plan which sets maximum limits on this proposed new component in wholesale power costs was submitted to each district by Dr. R. H. Hay, of Kingston.

The proposal to phase out payment of a "return on equity" was explained by A. J. Bowker, of Gloucester Township, OMEA first vice-president.

Mr. Bowker said the contentious equity question, referred back to the power costing committee for reconsideration last March, was being re-submitted to the district meetings and described the proposal as "a reasonable compromise all around."

Voting on the two issues, conducted by secret ballot, will be weighted according to the amount of power purchased by each utility.

Ontario Hydro comptroller Frank Gomer said the commission seeks to borrow approximately $4 billion over the next five years in competition with governments and other energy producers. Construction expenditures will exceed $5 billion over the same period. He presented an Ontario Hydro proposal to reduce the rate stabilization fund by $150 million over the next five years and to introduce a system expansion charge to raise additional revenue.

Hydro's current expansion program, which has been approved in principle by the provincial government, includes plans to double the size of the Pickering and Bruce nuclear stations, to build a thermal station at Wesleyville, near Port Hope, a nuclear station near Bowmanville and additional generating facilities in Northern Ontario. Mr. Gomer indicated that additional heavy borrowing will be required for these projects, which are scheduled to come into service in the late '70s and early '80s.

The effect of the system expansion charge would generally be similar to the OMEA's proposed capital contribution, but delegates voted only on the detailed association proposal. Both proposals would either stabilize or reduce Hydro's debt-equity ratio, which under current policies has been increasing each year.

Efforts to prevent any further increase in Hydro's debt-equity ratio were urged by Task Force Hydro in its report on financial policy and rates.

Mr. Gomer said that as the debt-equity ratio increases, borrowing becomes more difficult and funds can be obtained only at increasing cost. In urging steps to protect Hydro's financial integrity, he said the existing debt-equity ratio of 79:21 is high but it was difficult to judge when the commission's credit rating might be threatened. It could occur suddenly before corrective action could be taken, he said.

Dr. Hay said existing financial arrangements are now inadequate to cope with today's needs for capital.

The OMEA proposal would hold the debt-equity ratio at its present level for four or five years and then reduce it gradually to less than 75:25 but more than 70:30.

To achieve this objective, an initial capital contribution is proposed which, when taken in combination with the annua provision for debt retirement, will not exceed 10½ per cent of the total municipal equity. Total municipal equity includes debt retirement payments by municipal utilities and funds set aside on their behalf to stabilize rates and meet contingencies such as low water levels.

An annual rate of increase is proposed that will not exceed three-quarters of one per cent of the total municipal equity per year. This will continue until the total amount of capital recovered is 15 per cen of municipal equity a year or until a debt-equity ratio of 75:25 is reached. Subsequently, the capital contribution will be maintained at a level to keep the debt-equity ratio within the proposed limits.

Hydro proposes to cease rate stabiliza tion fund charges in 1974 and to invest available funds in Hydro assets over the next five years. Dr. Hay explained that financial experts believe the fund can be safely reduced without affecting Hydro's financial stability. (About 40 per cent of th fund is already invested in Hydro bonds.)

Dr. Hay said substantial savings in interest costs would result by reducing Hydro's borrowing. The proposed capita contribution would decline as a percentage of wholesale power costs and, perhaps in 15 years, savings in interest woul equal the capital contribution.

The initial contribution would amount



ey speakers at the OMEA district meetings included Dr. R. H. Hay, Archie McGugan and . J. Bowker. The trio explained financial issues to OMEA delegates.

) six per cent of the bulk power cost, or bout $4 per kilowatt in 1974. The esti- ated effect on an average residential ustomer's bill for 750 kilowatt-hours per onth would be 50 cents a month, he said.

In reply to questions at the District 6 eeting at Hespeler, Dr. Hay made these oints:

– The OMEA formula came out of dis- ussions with Ontario Hydro financial xperts.

– The amount of the capital contribution subject to annual review.

– Rural customers and industries served rectly by Ontario Hydro will pay appro- iate shares of the proposed levy.

– The ultimate control on Hydro borrow- g is the amount of money Hydro can ise on bond markets and the interest tes it has to pay.

On the return on equity issue, each unicipal utility was asked to vote on hasing out the current practice over period of four to eight years.

Equity represents the amount that each ember utility has paid toward retirement outstanding debt on the Ontario Hydro stem. Since 1965, each utility has ceived a "return" of four per cent based its accumulated equity at the end of e previous year. The "return" is financed a charge based on a utility's kilowatt mand.

On Ontario Hydro's books "return on uity" equals the "cost of return". But dividual utilities receive either credits debits in their cost of power statements ich, in some cases, have led to rate screpancies between utilities.

North York Hydro, which strongly poses the practice, incurred a debit of $714,768 in 1972 while for historic reasons Toronto Hydro received a credit of $1,760,559. Oil Springs received a credit which amounted to 10 per cent of its bulk power cost.

Mr. Bowker said that of 353 municipalities, 225 last year had a net credit while 128 had net debits. There was a net effect of less than $1 a kilowatt – a small fraction of the wholesale power cost – for 60 per cent of the municipal utilities.

The effect of phasing out the practice will vary between municipalities, said Mr. Bowker, but he estimated that the typical effect on a monthly residential bill would be 10 cents.

"A six-year (phase-out) period has the advantage of being long enough that the annual effects are in all cases small enough to be dwarfed by the anticipated increases in the cost of power," he said.

Under the plan, no utility would have an abrupt change in costs that would upset any long-term planning, he said.

How the voting went

A capital contribution toward the wholesale cost of power to reduce Ontario Hydro's borrowing requirements has been approved decisively by the OMEA.

In weighted balloting held in all nine OMEA districts, municipal utilities carried the question of the capital contribution by 2,524 votes to 248.

The utilities also approved the phasing out of the practice of paying a return on equity.

The vote, also weighted, was 1,975 to 873 on the phase-out question. On the period of the phase-out, 1,034 favored six years, 937 opted for four years and 808 preferred eight years.

Call for Hydro stock issue

The OMEA will be asked to approach the provincial government with the objective of issuing common voting stock certificates in the new Ontario Hydro corporation to each municipality operating an electrical distribution system. Certificates would equal the accumulated value of equity in Hydro as of June 18, 1973.

Delegates at the District 9 OMEA meeting in Sudbury overwhelmingly endorsed a North Bay Hydro resolution calling for the voting stock certificates. (Task Force Hydro, in its role and place study, recommended that non-voting participating shares be issued to the municipalities.)

As an alternative, the North Bay resolution called for the government to pay cash to the municipalities for their equity, at an interest rate of 9 per cent.

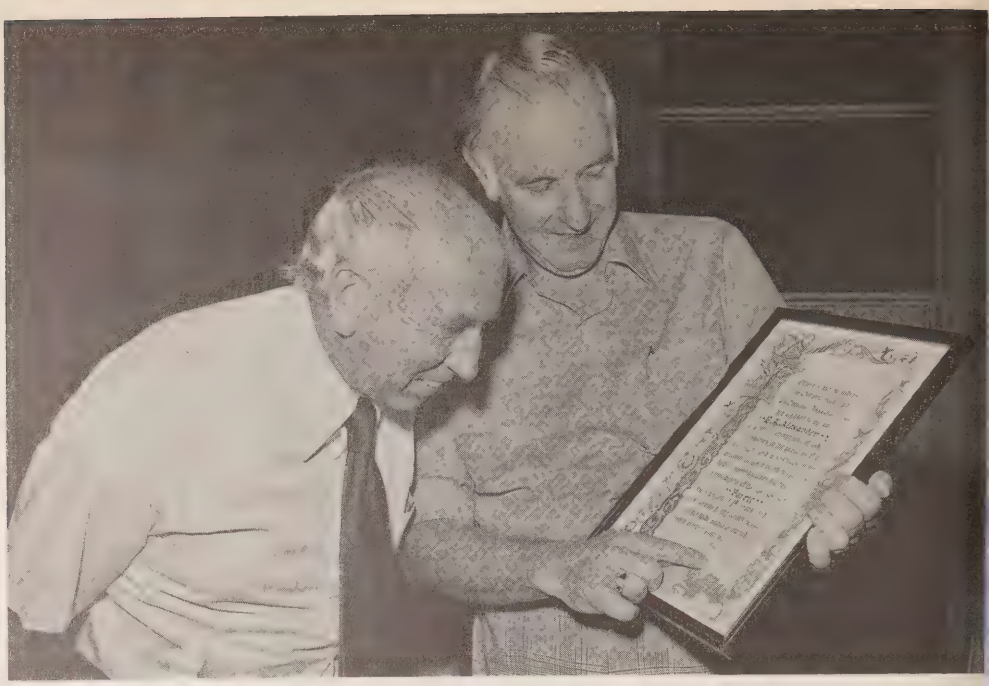
Willard Richardson, North Bay Hydro chairman, said the move was not a political one as far as his utility was concerned. It was "strictly business."

"We're a little disappointed and concerned that we do not have any information as to the intent of the government. It appears that management is a little out of reach for the municipalities, but we feel that the government should complete its takeover of Ontario Hydro – or give the municipalities the right to manage.

"The municipal utilities are paying the money of the people of our communities into Hydro, therefore we should become part of the corporation. We should have share privileges and elect the board of governors, or get our money out and become customers where we purchase the power for our consumers.

"We just don't know where we stand and this resolution may be the basis to clarify and identify ownership of Ontario Hydro," Mr. Richardson said.

"It's time for the government to let us



OMEA president Ernie Alexander examines a long-service award presented to him at the District 2 meeting. D. R. Larkworthy, of Stratford, looks on.

know if they've made up their minds whether they're going to have control of Ontario Hydro. And if so, is it going to be something like the banana republics where the government completes a take-over without compensation?" he asked.

Move quickly: Alexander

The OMEA must react quickly to recommendations by the Committee on Restructuring Public Utilities, said OMEA President E. R. Alexander.

"I cannot prejudice the work of the committee," he said. "It has a very important and crucial task to carry out. Its recommendations will determine for the next several years just how – and how well – the electrical consumer will be served, and by whom."

Mr. Alexander told delegates they must remember that in the past few years the influence of civil servants at all levels has been enhanced while control by the titular political chiefs has weakened.

"Because of this, we must have a concern for the continued effectiveness of the elected politician in any new proposals on the restructuring of public utilities, on regional government and on Ontario Hydro.

"Can, in fact, the public interest best be served by tipping the scales further in favor of the employed professional?" he asked. "What kind of representation will the public get from the restructuring of municipal Hydro commissions? Is a bigger operation, a stronger staff and less elected representation in the public interest?"

Mr. Alexander said the utilities will share a responsibility with the Ontario Hydro board of directors and the provincial government to see that Ontario Hydro is not subjected to delaying tactics that impede the development of generating stations and transmission lines.

"We must also do our part in seeing that the required rates for service are understood and agreed to, so that the high standards of security of service we have developed and enjoyed to this point will continue," he added.

Mr. Alexander said the OMEA must continue to press for adequate representation for the municipal utilities on the board of Ontario Hydro. "To do this most effectively, each of us as municipal commissioners must be well informed. We must be united, well-organized and active in both the municipal and provincial energy arenas."

Better communications essential: Seath

Improved communications and co-operation between utility commissioners and managers are essential, especially in view of the changes facing the Hydro organization, says AMEU President D. M. Seath.

"We are in exciting and crucial times," Mr. Seath told delegates. "Government has assessed our operations in Task Force Hydro and policy for the restructuring of electrical utilities in regional government areas is in the process of formulation.

"In both instances, the AMEU and the OMEA have their individual and combined role to play. There was representation from both associations on Task Force Hydro committees as there is on the Committee on Restructuring Public Utilities.

"There is no matter which requires consideration by either association which is not of interest to the other," he added. "The AMEU is ready, willing and able to provide the OMEA with well considered, responsible recommendations with relation to the establishment of policy. . . .

Mr. Seath said a positive approach is needed toward current pressures and changes. "If we are to retain our system of local autonomy – no matter what size and number of utilities are involved – we must think in the future and not limit our thinking to our own tight little islands.

"I suggest that we face the future positively, recognizing that there is a definite need for our two associations in the affair of Hydro in Ontario. Our most effective contribution will be based on a complete and continuing co-operative approach, ensuring that we create policy and disseminate utility operations information and recommendations for large and smal utilities in order that all the people of Ontario may benefit."

Fleming announces northern plans

Delegates attending OMEA district meetings across the province have been told Ontario Hydro will do everything possible to avoid a shortage of electricity.

Hydro Commissioner J. D. Fleming sai that generating stations under construction should provide ample generating capacity to meet increases in power demands until 1977.

"Never since the late 1940's has Ontari Hydro had to interrupt firm load in order to meet peak demands. We are doing – and we will continue to do – everything we can to assure an adequate power supply," he added.

In the Northwest, Dr. Fleming told

elegates at the District 3 meeting in ort Frances that Hydro will be seeking site over the next few months for a econd thermal-electric station to serve ne region in the 1980's.

"The new station," he said, "is part f the expansion program approved in rinciple by the Ontario government and abled in the Legislature on June 7 along ith the comprehensive report on energy eleased by Energy Minister Darcy lcKeough.

"The total program involves about 4 billion and includes several new major enerating stations across the province."

Dr. Fleming said another part of the rogram affecting the Northwest is a roposal for two additional units at the xisting Thunder Bay generating station.

He added that Hydro intends to follow course of public participation in deter- ining where the new generating station ill be located. The plant, he said, would ave an initial capacity of 800,000 kilo- atts. (Public meetings were scheduled be held in Thunder Bay in October s a first step in determining the site).

The new site will involve up to 1,000 cres, be located along Lake Superior latively close to Thunder Bay – the gion's centre of demand – and will ovide room for expansion.

"The station will probably be fossil- elled, but could be nuclear," Dr. Fleming aid.

In the Northeast, Dr. Fleming told dele- ates to the District 9 meeting in Sudbury at forecasts indicate additional gen- ating capacity will be required to meet aring power demands in that sector the early 1980's.

He said Hydro is studying the merits "either beefing up our extra-high- ltage transmission network to bring ore power north from Southern Ontario building a new 2,000,000-kilowatt nerating station, either fossil-fuelled nuclear, in the region."

Dr. Fleming added that as part of the eliminary study, Hydro is looking for tential generating station sites on the akawana lignite deposits near Moosonee, in the Parry Sound area, around Little Current on Manitoulin Island, the area of the north channel of Lake Huron between Manitoulin Island and the mainland in the vicinity of Blind River, and Lake Wanapitei, near Sudbury.

"In our investigations of potential sites along the Great Lakes shoreline, we are looking for a location which could serve as an energy centre – that is, a location suitable for the construction of another station in the more distant future," Dr. Fleming said.

He pointed out that in the case of Lake Wanapitei, Hydro is thinking only in terms of a single station because water available for cooling purposes is relatively limited. "If we did decide to build a station there we would make it a nuclear plant to avoid adding to the heavy demands already being made upon the air quality in the Sudbury area."

Dr. Fleming said that if a station is built at Onakawana it would burn the lignite available in the area. Any station located there would probably have a capacity in the range of a million kilowatts. "However, the problem with Onakawana lignite is that it has a high moisture content and a low heat value."

He said the studies Hydro is conducting of potential generating sites in North-eastern Ontario are only of a preliminary nature and are an assessment of the best means of providing future power supplies to the region.

"If these studies indicate that a new generating station should be built rather than increasing the transmission capacity from Southern Ontario, Hydro will involve the public in the selection of a suitable site," Dr. Fleming said.

Dr. Fleming, who also spoke at the District 6 meeting in Hespeler-Cambridge, said that Hydro is "fully committed" to the principle of involving the public in siting generating stations and transmission lines.

"We want to give the public a voice in the determination and location of Hydro facilities. We want to find locations which are acceptable from all points of view, including cost and their impact on the community as a whole.

"If the interests of the community are to be served, however, it is imperative that representatives of the so-called silent majority speak out. If they don't, they may find out what it's like to be silent in the dark," Dr. Fleming said.

He added, however, that problems remain on how to finance proposed generating projects and how to gain public acceptance of them in time to ensure that they are completed and ready for service when needed.

Rate increases will be needed to ensure sufficient funds for expansion and to maintain Hydro's financial stability. The proposed rate review process, which will apply to rate increases starting January 1, 1975, "should provide the necessary reassurance that increases are indeed necessary and justified," Dr. Fleming said.

'Opt electric' for flexibility

Ontario Hydro's economist-in-charge of load forecasts, L. T. Higgins, has called on energy consumers to "delegate their flexibility" in fuel selection to Hydro to avoid any potential energy crisis.

Mr. Higgins told District 9 delegates that by using electricity for home heating and cooling the consumer does not become "locked in" to any one energy source.

"Delegating this flexibility to Hydro is much better than losing it," he said, "for we make electricity from a number of different fuels."

Mr. Higgins pointed out that oil and natural gas prices are skyrocketing and both fuels are in short supply – particularly natural gas. He suggested that a partial solution to any potential energy crisis in Canada would be through the nuclear power program.

"The U.S. natural gas shortage is a critical one," he told delegates. "In 1970, natural gas production amounted to about 22.5 quadrillion BTUs, and in 1985 that production is expected to be cut to about

15 quadrillion BTUs, including the output from Alaska.

"With imports, the U.S. total natural gas supply should come up to 22.2 quadrillion BTUs to meet 1985 demands for 40.1 quadrillion BTUs – a deficit of 17.9 quadrillion BTUs," Mr. Higgins said.

He predicted that a great deal of energy consumption will be diverted to electricity, particularly in Ontario where natural gas prices will rise more than any other fuel. This increase will show up with the ultimate customer during the 1980's "when Hydro will be heavily into nuclear technology."

The U.S. crisis cannot be solved by Canadian natural gas reserves, he said. The Mackenzie Delta's total capacity is about 1.4 quadrillion BTUs a year and "any contribution Canada could make would be fairly trivial."

"However," he said, "there is a solution. The gas gap can be filled by conversion to electricity using nuclear generation."

As for coal, which was still plentiful in the U.S., the cleanest way to convert it into energy was in large central power stations, Mr. Higgins added.

Plea to participate — in participation

A plea to the municipal utilities to get involved in Ontario Hydro's public participation programs for new transmission line routes and generating station sites was made by J. J. Durand, Hydro's director of public relations.

Mr. Durand outlined the reasons for public participation and said it was important for the municipal utilities to offer suggestions and criticism where necessary about Hydro's plans.

"The public planning process is intended to solve problems, usually the balancing of a prosperous economy against a high-quality environment," Mr. Durand said. "This is going to take a lot of co-operation within the utility industry, a lot of co-operation within the public sector and a willingness on the part of governments to make courageous decisions. Without this leadership we'll have nothing but continuous confusion.

"Obviously, you have a direct interest in Ontario Hydro's ability to get facilities built in time and at reasonable costs – after all, your supply and your rates are directly involved," Mr. Durand added.

He told delegates that as representatives of an important local business, they were able to assess community attitudes and gauge the viewpoints of local groups, authorities and even individuals in relation to local projects.

Mr. Durand suggested that no one else in the community could better represent the interests and views of utility customers. The municipal utilities might determine when they should submit briefs to, or attend, public participation meetings or in some other way get their views recorded.

"This is not to suggest that you should always agree with a specific line route or the station site selected by the generating authority. Judge the case on its merits and form your own point of view and that of your customers. In any event, if possible, get involved in the process."

Mr. Durand added that Hydro had adopted the open planning approach because of pressures in recent years from groups like Pollution Probe and the Sierra Club. These groups, in seeking environmental controls and the establishment of review boards, quite naturally picked on Hydro because it is a large public service organization.

"No utility in North America is putting more effort into planning with the public's participation than is Ontario Hydro," said Mr. Durand. "We are proud of our program and optimistic about its future. We know that mistakes will still be made, but as we eliminate them we are confident that with the public's co-operation we'll end up with a better process that will be a credit and a benefit to all of Ontario. We are very close to that now."

HYDRO REPLIES TO COMMITTEE REPORT

The broad criticism of the Commissioners of Ontario Hydro by the Select Committee tends to obscure several points which are essential to a fair-minded assessment of the report.

The committee found no major flaws in the contract with Canada Square and made no overall judgment. We remain convinced that it is financially and economically sound.

Moreover, questions raised as to improper motivations by Hydro commissioners and staff, suggestions of political influence, and the issues of abandoning the original plans, are all answered in terms favorable to the Commission.

At the beginning of the hearings last May, the committee defined six issues as basic to its hearings. Five of the six relate to Hydro:

1. *Are the terms of the agreements, as the affect Ontario Hydro, financially and economically sound?*

After an exhaustive examination, the committee is unable to answer the question asked. The report "expresses concern that Hydro may not have negotiated an agreement for the lowest rental rate available." It "offers the opinion that a more provident arrangement (on commercial space) could have been negotiated", and, in general, concludes that "Hydro does not appear to have take advantage of its negotiating position relative to the benefits available to the developers."

Nowhere in the report do we find anything which detracts from the basic soundness of the agreement from a financial and economic point of view. The central facts remain:

- Hydro obtains first-class head office accommodation at rental rates which remain fixed for 30 years and are less than the current market;
- At the end of the 30-year period, Hydro becomes the owner of the building at no further cost;
- The risks of escalating construction costs and interim financing are borne entirely by Canada Square;
- The profits accruing to Canada Square

The report of the Select Committee set up by the Ontario Government to inquire into the contracting of Hydro's new head office was tabled in the legislature in October. Forty-four witnesses testified at the hearings between May 22 and September 17. The committee spent six days in closed session to deliberate on the 7,500 pages of transcript. After the Select Committee's 12-page report came out, the following statement was released by the Commissioners of Ontario Hydro:

depend mainly on its success in developing a commercial area and then Hydro obtains its share of these profits. Any anticipated profits by Canada Square are not out of balance with the risks it undertakes.

. Does the agreement provide benefits and advantages which justify the decision to abandon previous plans for construction of a building owned and financed by Ontario Hydro?

The report "finds that Hydro was justified in abandoning such plans."

. Did Ontario Hydro take all steps necessary to obtain competitive proposals?

The report is critical of Hydro's procedures in calling for and judging competitive proposals. We accept these criticisms. In the course of the hearings, Hydro recognized these procedural omissions, which were not evident when the decision was made to proceed with the building. The proposal method was new to Hydro and it is significant the committee has not rejected that method as one available to public agencies. Hydro has learned from these mistakes and they will not be repeated.

Did Mr. George Gathercole, members of the Ontario Hydro-Electric Commission the chief architect of Ontario Hydro and the members of the staff of Ontario Hydro, or any of them, in any way have their judgment respecting the agreement for the new head office building affected by any consideration other than what was in the best interests of Ontario Hydro and the people of Ontario?

The committee finds "that all persons within Hydro involved in the decision-making process were at all times of the belief that their actions were in the best interest of Ontario Hydro."

The Commission regards this as the most important finding of the entire report, that it clearly dismisses any hint of impropriety or political influence affecting the award of the contract to Canada Square.

Was the agreement of a nature and of such importance that Ontario Hydro should have submitted it for consideration on a policy basis to the Minister reporting for Hydro?

The report says: "To the extent that there was any obligation on the part of Hydro to keep government informed of its intentions, it did so by the communications between Gathercole and the Premier . . ."

6. (a) Who was the person who alleged that there was a warning delivered by someone to one of the unsuccesful bidders that if he did not be quiet, he would never get another government contract?

(b) Was such a warning in fact ever delivered?

(c) If such a warning was delivered, by whom and to whom was it delivered?

This question does not involve the Commission in any way.

Of greatest importance to the Commission was the timing of the contract in the light of rapid inflation, escalating construction and interest costs, and the need to consolidate a scattered staff.

On this point, the committee states: "Hydro recognized that delay would confront them with increased costs of constructing the building, resulting from inflationary tendencies in the economy, a fact borne out by subsequent developments. The delay inherent in completing a revision of plans and use of the tender method was avoided by contracting with a developer."

The committee also censures Hydro for providing what it calls "misleading information" to the government and to the Legislature. The evidence given at the hearings shows that Hydro officials honestly believed in the accuracy of the information supplied and acted in good faith and the Commission rejects the contention that there was any intention to mislead.

In view of the committee's favorable findings on four of the five relevant issues defined by it, and the endorsement of the decision to proceed by the developer-proposal method, the Commissioners cannot understand the committee's statement that "there was an abdication of their responsibilities."

Surely results must count for something in assessing the performance of any administration, and we believe the contract with Canada Square has successfully withstood a more searching examination than any contract of its kind ever signed in Canada. No transaction has ever been made in which some improvements could not be suggested with the benefit of hindsight and 4½ months of study.

In its closing paragraphs, the committee recommends that the standards of the Business Corporations Act applying to directors of corporations should be "imposed" on members of the Hydro Commission.

The Business Corporations Act defines the standard of duty of a director of a business corporation in this way: "Every director and officer of a corporation shall exercise the powers and discharge the duties of his office honestly, in good faith, and in the best interests of the corporation and in connection therewith shall exercise the degree of care, diligence and skill that a reasonably prudent person would exercise in comparable circumstances."

The committee has expressly found that the Commissioners discharged their duties honestly, in good faith, and in the best interests of the corporation, as set out in the Act.

As to care, diligence and skill, surely the fundamental test is the basic soundness of the contract. We remain unshaken in our belief that when the building is completed, an appraisal taken, and the lease approved, the judgment of the Commission will be vindicated. □

along hydro lines



Hog wild



Bringing home the bacon

Mrs. Betty Plant is off to a good start on the farm she and her husband have purchased for their retirement. Her colleagues at Brampton Hydro, where she spent 32 years as secretary-treasurer, have presented her with a "well-scrubbed young Yorkshire pig" – the first bit of livestock for their spread near Lindsay.

The animal was delivered in a large crate to a civic dinner at the Brampton Golf and Country Club where groundman Bill Foster (above) helped her unpack.

Sequel to the story: as it takes two to tango, Mrs. Plant purchased a mate for her boar – only to discover she'd accidentally bought a pig in a poke. Porky's new partner turned out to be a boar, too.

D. G. Moffitt

A former secretary of Toronto Hydro, Douglas Gordon Moffitt, has died in Victoria, B.C., after a long and varied career.

Mr. Moffitt was born in Florence, Italy, and received his early education in Australia. Apart from attending university in Adelaide, he subsequently studied at the universities of Manchester, Pittsburgh and Toronto.

Throughout his working life, Mr. Moffitt held a number of engineering positions including that of chief erecting engineer with the Municipal Tramways Trust in Adelaide. He also worked for the Westinghouse company in both Britain and the United States. He joined Toronto Hydro in 1920 after serving in Gallipoli and Egypt in the First World War. In 1951, Mr. Moffitt was appointed commission secretary and in 1953 became manager of the appliance department. He held this position until his retirement in 1958.

During the Second World War, Mr. Moffitt served in an administrative capacity with the British Air Commission in Washington, D.C. His posts there included director of aircraft production and director of secret and confidential communications under Lord Beaverbrook. In 1943, Mr. Moffitt was made responsible for co-ordinating international industrial standards affecting the production of aircraft. He was awarded the MBE in 1946.

Canadian accelerator

Canadian researchers are making a major step forward in the field of nuclear physics with the building of one of the world's largest nuclear accelerators.

Called TRIUMF, the project is under construction in Vancouver and is a joint venture of the Victoria, British Columbia, Alberta and Simon Fraser universities.

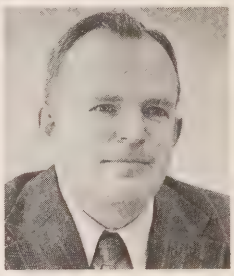
TRIUMF is built around a cyclotron that will accelerate protons to an energy of 500 million electron volts. The protons will be aimed at targets which emit beams of secondary particles such as mesons and neutrons.

The cyclotron is more complex than any built before – the number of mesons provided will be 1,000 times greater than by any existing installation.

While the prime objective of the accelerator will be basic research, it will also be used in such practical applications as neutron activation analysis in the detection of trace elements, rapid chemical analysis of pollution samples, forensic analysis, and the production of neutron-deficient radioisotopes. The B.C. Cancer Institute will use the accelerator to study the radiobiological effects of pi-mesons as a possible powerful therapeutical source.

Major components of the cyclotron consist of a 4,000-ton magnet, a 60-foot diameter high-vacuum chamber and a support and elevating structure.

Name's the same



Elgin Horton



Sam Horton

There's been a change in operations managers at the Bruce Nuclear Power Development, but the surname on the office door stays the same.

Elgin Horton, former station manager at Pickering generating station, has replaced his brother, Sam, who becomes project manager for the Bruce development. Kevin Keane has replaced Elgin as station manager at Pickering.

Sam Horton joined Hydro in 1960 as senior technical engineer at the Nuclear Power Development, Rolphton, and three years later became assistant superintendent there. He was appointed superintendent in 1965 and became superintendent at the Douglas Point Nuclear Plant in 1967. He was named Bruce operations manager in 1969.

Elgin Horton began his Hydro career three months after his brother. A full engineer and senior technical engineer at NPD between 1960 and 1965, he subse

ently worked on commissioning the
uglas Point station and making prepa-
tions for sending a Hydro team to
mmission the Rajasthan nuclear power
ation in India. He served three years as
anager of NPD and was appointed
ation manager at Pickering in 1970.
Both brothers worked for Atomic Energy
Canada Limited before joining Hydro.

lact finders



w Brunswick government and electric
wer officials recently met representa-
es of the Canadian Nuclear Association,
omic Energy of Canada Limited and
tario Hydro as part of a fact-finding
ssion on nuclear power.
Shown here examining a model of the
actor face at the Pickering nuclear sta-
n are John S. Foster, vice-president
AECL; T. Stewart Brooks, chairman of
New Brunswick Electric Power Com-
ssion, and Kevin Keane, manager of the
kering station.

bert Campbell

mer Metropolitan Toronto chairman,
ert McTaggart Campbell, has died at the age of 63. A former mayor of Scarborough, Mr. Campbell was chairman of the Metro Council for nearly four years until ill-health forced his retirement.

Mr. Campbell, who was once a science teacher, was the first reeve of the Village of Scarborough and was later mayor for 13 years. A six-acre public park at the borough's civic centre has been named in his honor.

As chairman of Metro Council from 1969-73, Mr. Campbell saw urban government become increasingly complex as population growth increased the pressure for a wide range of municipal services. A cautious and somewhat private individual, he liked to do things in a quiet fashion and gained a reputation among other civic leaders for his dependability and honesty.

Mr. Campbell has been succeeded in the Metro chairmanship by North York Controller Paul Godfrey.

EHV mini-station

Plans to build the world's first extra-high-voltage substation using sulphur hexafluoride (SF_6) gas as an insulating medium have been announced by the American Electric Power Company. The station, to be built at Lynchburg, Va., is subject to approval of the Virginia State Corporation Commission.

The installation would introduce the concept of the mini-substation to the 765,000-volt level, the highest voltage used for power transmission in the U.S. Its chief advantage is that it would use about one-tenth of the land required for a conventional station.

To be known as the Ivy Creek station, the installation would serve as a key terminal at the eastern end of the AEP system's six-state 765,000-volt transmission network.

Because SF_6 under pressure has approximately three times the dielectric strength of nitrogen – the most abundant element in air – its use as an insulator greatly reduces the electrical clearances required in substation design work.

Lower-voltage applications of SF_6 technology were first made in Europe and Japan in the late 1960's, a practice adopted there because of the need to install substations on comparatively small plots of land in and around major cities. The technology was extended to the U.S. in 1971. Approximately 10 such substations are now in operation in the U.S. at 138,000 volts or lower. Ontario Hydro plans to build a 115,000-volt SF_6 station in downtown Toronto.

Who's your tailor?



Groovy, isn't it?

For several years, W. Ron Mathieson, manager of the Association of Municipal Electrical Utilities, has made sport of the ties worn by Niagara Hydro manager John Dawson.

They were always – well, to say the least ,colorful – and at every meeting Mr. Mathieson attempted to pry from Mr. Dawson the name of his tailor. At last, Mr. Dawson confessed. But first he presented the association's manager with a six-foot version of a Dawson tie.

The tailor?

Mrs. Dawson, of course.

New district officers



The men who will head up District 9 of the Ontario Municipal Electric Association for the coming year include, back row: R. S. MacKay, Thessalon; B. H. MacPhail, Capreol, past president; A. W. Cooke, North Bay; R. E. Levert, Sudbury and Joe Bleommen, Coniston. Seated: G. J. Fitzsimmons, South River, third vice-president; V. E. Gardi, Sault Ste. Marie, president, and Raoul Vaillancourt, Hearst, second vice-president. Absent when photo was taken was Ken Rochon, Cochrane, first vice-president.



Executive members of the Georgian Bay Municipal Electric Association for the coming year are, front row: John Murphy, Barrie, secretary-treasurer; H. J. Cameron, Kincardine, second vice-president; W. G. Boyes, Alliston, president; Gordon Tudhope, Parry Sound, first vice-president and N. H. Robertson, Owen Sound, past president. Back row: Aubrey Mason, Wiarton; Bill Logan, Midland; James Church, Bradford; Carl Larsen, Walkerton; Gordon Borneman, Gravenhurst; Bob Gardhouse, Port Elgin and Ross Densmore, Arthur.



District 6 of the OMEA elected these officers in Hespeler-Cambridge. Front row: C. C. Smith, Guelph, 2nd vice-president; Antoine Garon, Clinton; George Filsinger, Goderich; Edmund Daly, Seaforth; C. J. Seltzer, Tavistock, and W. A. Smith, Waterloo, 1st vice-president. Back row: L. P. Breithaupt, Kitchener; D. R. Larkworthy, Stratford, past president; E. D. Constant, Hespeler; A. T. Brown, Galt, and D. M. Seath, Stratford, secretary-treasurer. John M. Lind, St. Marys, was elected president.



Frank England, chairman of Kenora Hydro (second from left, front row) was elected president of District 3 of the OMEA in Fort Frances. Other members of the new executive are: front row, Marv Kelly, Atikokan, secretary-treasurer; Mr. England; Webb Calder, Atikokan, past president, and Don Bainbridge, Atikokan, second vice-president. Back row: Ron Wilmot, Thunder Bay; Martin Euler, Dryden, and Gino Caccamo, Schreiber. Missing from photo are Ed Ariano, Sioux Lookout, first vice-president, and Bill Spicer, Thunder Bay.

municipal briefs

Fergus PUC has appointed 48-year-old Douglas W. Johnson as its new superintendent. He succeeds C. A. (Sandy) Graham who has retired. Mr. Johnson was a Hespeler PUC employee for 28 years, the last 10 as superintendent.

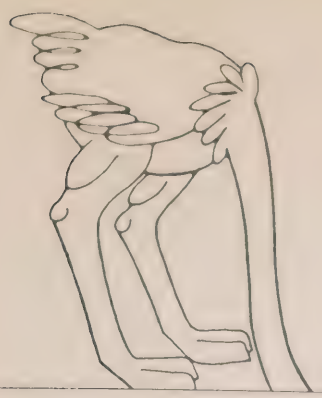
Port Hope Town Council has committed $46,000 in its 1974 budget for the purchas of the town's street lighting system from Port Hope Hydro.

Port Burwell PUC has moved into renovated offices in the community's municipa hall. The utility's office was located in the home of secretary-treasurer Audrey Sampson for 18 years. But now Miss Sampson is retiring.

About 75 friends turned out to a Parkhill PUC-sponsored dinner to pay tribute to retiring general manager-secretary Vincent Hamacher. The civic dinner had been postponed since last October due to Mr. Hamacher being ill.

Niagara Falls City Council has voted to purchase 10.36 acres of Ontario Hydro land at a cost of $19,575 for development as part of a system of walkways and bicycle paths in the city's northwest sector. Council plans to spend an additional $5,000 to develop the land with benches, landscaping, bicycle racks and signs.

Toronto's air pollution levels have shown considerable improvement in 1972, Toronto Hydro says in its annual report. "Some credit for this improvement," Toronto Hydro says, "can be given to the increasing number of owners who have chosen to heat their buildings electrically." The report shows an increase in energy sales of 8.5 per cent over the previous year and an 8.16 per cent increase in the peak demand.



as don wright sees it

We find ourselves a bit pressed for time this month and must beg our readers' indulgence if our performance is not quite up to scratch. But stick around. We'll still have time to solve a few niggling problems – including the world energy crisis and global pollution. First, we'll work out a way to make our fuel reserves go around and then we'll get rid of the dirt.

As you may have noticed, every writer worth his salt has had a go at resolving the energy shortage and experts have been crawling out of the woodwork with remedies ranging from insulated and flapless long-handled underwear to a detailed 74-point program which includes stealing granny's shawl.

Most of these suggestions have not been sufficiently well thought out and could do more harm than good. This certainly applies to the lecherous suggestion that we share our showers and sleep with a friend. Sure it's a fun way to save heat and hot water but a population explosion is hardly the answer to either conservation or pollution.

And wouldn't you know when the crunch begins to hurt they'd suddenly discover it was good for us? University of Toronto scientists tell us their studies show that we'd all sleep better and love better if we turned the thermostat down to around 68 degrees.

If these people are right, why didn't they speak up long ago? We don't mind the sleep we've lost to heat over the years, but that off-peak performance in the other direction is harder to reconcile.

Many of the millions of helpful hints involve the automobile and these range from driving so as not to break a very old egg placed under the gas pedal to the thought-provoking suggestion that we drive our cars only downhill.

Toronto Star columnist Gary Lautens is more practical. He'd have us drill for oil under the City of Toronto. The thought occurred to him, of course, that there is no oil under Yonge Street, but he covers that one off nicely. The trick is to drill straight down for one mile, put on an elbow joint, and then drill straight east for 7,000 miles to the Persian Gulf.

We doubt if the Arabs would take kindly to that kind of ploy, but then there probably aren't many people who care how the Arabs feel these days. Oily Baba and his boys lose much of their glamor when viewed from behind a goose pimple.

■ Compounding the dilemma for the non-expert, and there aren't many of these left, is the choice of bedmates. It's getting more and more difficult for the bonafide environmentalist to share the sheets with a dyed-in-the-wool conservationist even though they seem to have many of the same concerns.

The conundrum is this. Should we be using contraptions on our autos to clean up the air even though this increases the consumption of precious gasoline? And should we be making electricity from clean-burning natural gas when the supply is limited and nonrenewable?

If the two points of view can snuggle up for even a night or two perhaps their offspring might be a better perspective with an appreciation of the need to give up a bit in one direction to help out in the other.

■ But that's not solving the long-term energy problem as we promised so let's get on with it. Fundamentally at fault is our penchant for thinking big. Over the years we've all been programmed to equate largeness with goodness.

Eat your spinach and you'll grow up big and strong. Wear our elevator shoes and look like the jolly green giant. We have got to shake this six-foot-two, eyes-of-blue fixation and start thinking small.

We're not just talking in terms of smaller cars or smaller houses or reduced consumption. All these will follow when we get at the root cause of the energy shortage – people. We must start making smaller people.

Firm government leadership is the first requisite. All biologists and genetic engineers should be called in and the national goal made clear – three-foot people by 2050, two feet by 3000. Provide every scientist with free test tubes, fresh white smocks, subsidized microscopes and put them to work trimming the fat off our genes.

Jonathan Swift had somewhat the same idea a century or so ago, but his Lilliputians were only six inches high and had nothing to do with conservation. Quick slide rule calculations suggest that two feet is about the minimum if we are to tote around a brain big enough to cope with the few problems which seem likely to remain.

The mind boggles at the advantages. Car pools with 25 people per vehicle. Houses the size of insulated bee-hives and each heated with four quarts of oil per year. Fifteen people sharing a tub-full of hot water. The list is endless and sheik-shaking in its implications.

Granted, this is no short-term solution. We can't do much with the people we already have, but some measures may be feasible. French fries, cream puffs and chocolate eclairs could be banned immediately. We could also base our tax structures on waist measurements and impose stiff fines on people caught taking vitamins. This wouldn't shorten us up much but at least we'd be able to crowd more people into a subway car.

Whichever way you look at it, the carrying capacity of our environment is limited and it should be easier to make people smaller than to make the world bigger.

Come to think of it, we've also solved about two-thirds of the pollution problem. There is no way a 30-pound two-footer can compete with the supermen we've been raising with such reckless abandon when it comes to making a mess.

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features

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North York publicizes its program of underground distribution with a "Down with Hydro" slogan. Utility is typical of many in Ontario actively engaged in underground installations.

8 Bending the rules helps save stranded ten

Hydro employees assist in a dramatic rescue on the Niagara River.

11 On top of the job

Crews master new techniques required for maintaining improved-appearance high-voltage transmission lines in London.

14 Tomorrow's coal in the pipeline?

The energy crisis has sparked renewed interest in the pipeline transportation of solid materials such as coal.

20 Sound way to reduce the intake of alewives?

Sound waves were generated in Hydro experiments aimed at scaring fish away from the vicinity of power stations.

22 Banking on those energy billions

Will sufficient capital be available to develop Canada's energy resources in the years ahead? Many experts feel the money will be forthcoming when it's needed.

28 Along hydro lines

Les Dobson, Editor
Paul Page, Design Direction
Isobel Morgan, Design

the cover

Seventy-five feet above a London subdivision, Hydro crews practise the tricky art of doing maintenance on a live 230,000-volt transmission line. Improved-appearance poles, which contrast sharply with the old-type lattice towers, require modified maintenance techniques. See story on page 11.

Photo: Neil McKay

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hydro news, volume 61, number 1

Published by Ontario Hydro, 620 University Ave., Toronto.
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Printed in Canada.

VIEWPOINT

The lights of Christmas past

Looking back on the festive season it can be said that Canadians were in an enviable position to celebrate the occasion from the standpoint of material blessings. Here in Ontario it was another Christmas of abundance and while the lights shone less brightly than in years gone by it was not because of any shortage of electricity.

The supply of electricity was more than adequate. The annual peak load occurred on December 17 and it was on the order of 13,717,000 kilowatts. System reserves at that time were in excess of 3,000,000 kilowatts.

In previous years, Christmas lighting has been estimated to add about 300,000 kilowatts to Ontario Hydro's load. Estimates indicate that two-thirds of this load did not develop last December. Electricity used for this purpose dropped by 200,000 kilowatts, which is equivalent to the total electrical requirement of 100,000 households or about 1.5 per cent of total demand. Why was there such a noticeable reluctance to turn on the traditional lights?

We suspect that most people weren't quite sure themselves. Perhaps they felt a vague sense of guilt at the thought of advertising their affluence when so many people elsewhere were really feeling the energy crunch. Others, no doubt, kept the lights out as their contribution to the conservation of resources, albeit with a very fuzzy notion of what they were accomplishing. Whether or not this gesture of self-denial was meaningful in the full context of the energy supply picture is up to the individual to decide.

Hydro utilizes a variety of resources to meet the electrical needs of the province. Of the electric energy made available in 1972, preliminary figures indicate that water power accounted for 43 per cent and the rest was thermal. Coal accounted for 22 per cent, nuclear 16 per cent, and natural gas 4 per cent. The remaining 15 per cent was purchased-mostly from Quebec.

Christmas lighting, particularly when used in the daily peak period from 5 p.m. to 6 p.m. is likely to be supplied from a mixture of these sources.

While the electrical supply picture is adequate and not likely to become critical this year or next, what of the future? There are some question marks.

Hydro is dependent upon coal from the United States for a significant proportion of its generation. Demands could not be met without it. And while most of this coal is supplied under long-term contracts negotiated by Hydro, its future availability could be influenced by the energy crisis. The full implication of fuel shortages on the U.S. economy is not yet apparent, but some oil-fired stations south of the border are being switched to coal. An extensive move in this direction would place added strain on coal-supply facilities.

At the same time, Hydro will require additional coal as its five new units are brought into service progressively up to 1977 at Nanticoke G.S. on Lake Erie. For this reason, Hydro is seeking to develop more flexibility in its supplies and is planning extensive testing on Western Canadian coal this year.

The role of oil in the Hydro system is clouded by the fast-changing supply situation and is constantly under review. The construction of a 2,300,000-kilowatt oil-burning plant on Lake Ontario near Kingston is well advanced and Hydro plans another plant of about equal size near Port Hope. Arrangements for a reliable supply of oil are being investigated.

Another factor which could influence the availability of electricity in the next few years is the delay in the construction of vital high-voltage transmission lines. Occasioned by the public participation process in the selection of routes, delays are mounting and could reduce the degree of system security for years to come.

For the present, however, electrical supplies are fully adequate. And since water, coal and uranium lighted our Christmas trees during off-peak hours last December, the use of power for this purpose could hardly be described as an orgy of extravagance. But the picture is continually changing and the philosophy behind the reduced use of decorative lighting is certainly sound.

Christmas, 1973, provided an opportunity to practice the conservation ethic which is becoming a part of the new lifestyle brought on by the realization that the world's energy resources are not unlimited. As the Prime Minister pointed out in his New Year's message: "We need not be without, but we must be good stewards of what we have."

Like any other form of energy, electricity should be used wisely. □

`down with hydro´ is looking up

but the problem of who pays for underground varies from one municipality to the next

by Bill Settatree

Throughout North York, the utility pole carry signs saying "Down with Hydro".

At first, it looks as though somebody has launched a major campaign to do away with the local utility. Not so. The signs were put there by North York Hydro itself, which is promoting a major progran to bury distribution lines.

Of the $2.5 million that North York Hydro spends each year on underground distribution systems, about $1 million goe toward the conversion of existing overhead lines. Chief engineer Les Clare says the conversion program affects area where the system is being uprated.

"If we have to build a bigger system somewhere, we go underground rather than install another overhead pole line," Mr. Clare says. In some cases improved appearance is the only determining facto especially along busy thoroughfares or in the vicinity of parks.

Today, about one-quarter of North York's distribution system is undergroun (263 circuit miles compared to 719 miles of overhead).

In common with other utilities, North York Hydro cannot justify the expense of converting entire residential streets or districts. On the other hand, if residents want underground service and are willing to foot the bill, the utility will do the work.

"I can only recall this happening once and that was a block of about a dozen homes," Mr. Clare adds.

Throughout the province, the popular ity of underground distribution has mushroomed since the early sixties. Late figures show that 102 municipalities have a policy to bury lines and 76 make under ground distribution mandatory in new subdivisions. In some cases, the municipality compels the developers to install underground service.

Lack of a universal policy on undergrounding, though, and the increased costs involved are causing concern among the municipal utilities and the construction industry.

URD (underground residential distribu tion) adds several hundred dollars to the price of a serviced lot and there are conflicting viewpoints on how this shoul



Underground distribution cable is frequently placed in plastic ducts such as these being installed by North York Hydro.

be handled. Should the homeowner bear the increased cost or should it be borne by the utility, indirectly passing the bill to all its customers? Does the improved appearance, security of service and safety of underground distribution justify the added expense?

Underground services are not susceptible to wind damage and icing conditions. Because trees no longer interfere with wires, the trimming of branches is eliminated from routine maintenance. Safety is also a plus factor. Underground lines are less likely to contribute to electrical accidents. The major disadvantage is that if a break does occur, it is usually harder to trace and interruptions are therefore longer.

The authors of Task Force Hydro's report on Financial Policy and Rates felt that the cost of a standard overhead system is included in retail rates and that only the difference in cost between an overhead line and underground should be passed on to the buyer. Reflecting this philosophy, Ontario Hydro makes an installation charge of $150 plus $2 for each foot of frontage for underground service. This figure represents the difference between overhead and underground installation costs.

Task Force Hydro maintains that in cases where the municipality insists on developers paying the full cost of underground service with no differential or rebate, the homebuyer is being discriminated against.

"We are not suggesting that a policy of undergrounding distribution systems is to be discouraged—quite the contrary," the report adds. "Our concern is solely with the method by which such improvements are financed."

However, those utilities which insist on the developers paying the cost argue that there is no hardship and no discrimination.

"Present and future exponential rates of growth make it difficult enough for the utilities to finance transmission lines, substations and trunk distribution feeders and meters without inflating our debt by servicing the actual subdivisions," says


DOWN
WITH
NORTH YORK
HYDRO



"About one-quarter of our distribution system is already underground," says Les Clare, chief engineer of North York Hydro.

rth York Hydro's underground conversion ogram is aimed at the replacement of erhead lines in high-density and scenic eas. This particular stretch of line ns alongside a golf course.

John Murphy, manager of Barrie PUC.

"This is exactly the same position in which the municipal corporations found themselves 15 years ago," Mr. Murphy said. "They solved the financing problem by creating what is known as the Standard Form of Subdividers Agreement. This concept looks at a subdivision development in much the same way as any other development, such as high-rise, as far as servicing is concerned."

"It means that the owner must provide at his cost water mains, sewers, roads, sidewalks, trees, and streetlighting to produce a viable property. He must also pay a special levy to support water services and pollution control plants."

Bert Fleming, manager of Mississauga Hydro, also feels that electricity is a service similar to sewers and water, and should be incorporated into subdividers' agreements. In fact, this has been the municipality's policy since the early 1950's, long before underground distribution became popular.

"We could not borrow money on Bay Street or Wall Street. We had no alternative but to insist that developers pay the shot when it came to installing services," he says. "We just carried on the policy with underground distribution."

Mr. Fleming says his utility spends about $6.3 million annually in its capital program without servicing new subdivisions. He questions the practicality of raising additional capital to provide underground service to the 3,600 new homes built each year.

While underground services add about $500 to the price of a lot, Mr. Fleming feels the amount is small in relation to the total cost of a house.

The undergrounding problem has been debated by both the Ontario Municipal Electric Association and the Association of Municipal Electrical Utilities, which between them represent the elected commissioners and appointed management staff of the municipal electric systems. An ad hoc committee of the AMEU is now formulating a province-wide policy.

The committee was established last spring following a request by the OMEA. Chairman A.G. Stacey, of Guelph, says the committee is recommending that a policy on undergrounding be established providing for some form of cost-sharing between utilities and developers.

"After all, the utility saves by not having to install overhead," he said. The proposal would be consistent with Ontario Hydro's differential policy. However, the mechanics of the scheme remain to be worked out.

Mr. Stacey also says that the ad hoc committee has urged the AMEU to further pursue the standardization of underground equipment.

Among other groups taking an interest in underground distribution is the Ontario Council of the Housing and Urban Development Association of Canada (HUDAC), which in 1972 circulated a letter to its members supporting the possibility of a "developer pays" approach and urging them to discuss such ideas with local Hydro officials.

But Peter Stevens, a spokesman for HUDAC, which represents builders and others in the housing industry, says the utilities should supply transformers and other heavy equipment.

Mr. Stevens feels there should be a better way of financing underground, perhaps through local improvement levies over a number of years, as is the case in Winnipeg. He claims that underground distribution is just one of the restrictions on Ontario developers that have contributed to escalating housing costs.

Rising housing costs worry the provincial government, too, and in 1969 it established the Ontario Housing Advisory Committee, an organization composed of builders, engineers and businessmen and reporting to the Minister of Revenue.

Last year, the committee commissioned a Toronto engineer, Jack Chisvin, to undertake a detailed study of underground distribution. Based on his report, the committee recommended to the government the establishment of a province-wide policy giving builder-developers an opportunity to install underground electrical service during subdivision devel-



opment. The study called for more standardization both in materials used and methods of installation.

"It is recognized that the cost of electric servicing as a percentage of total housing costs is relatively small. Nevertheless, it is our opinion that savings are possible in this area without jeopardizing the quality or reliability of service," said the report. The question of finance was also discussed and a standardized policy advocated.

Meanwhile, the underground servicing committee of the AMEU has been working on many of the problems of underground distribution. Spokesman Bert Hopkins says the pros and cons of submersible transformers (transformers which are buried) as opposed to pad-mounted units is one of the major technical matters to be resolved.

In 1972, the AMEU urged Ontario Hydro to embark on a major research program in an effort to get some answers. Hydro appointed research engineer Juri Kortschinski to head the program.

"Various novel approaches for the protection of underground transformer tanks from corrosion have been considered," Mr. Kortschinski says. "Of these, the most promising appears to be a rubbe sleeve over a mild steel tank as an alterna tive to conventional coatings."

However, the group is also studying

In some cases, cable is buried directly in the ground with no ducts. This installation in Mississauga combines both streetlighting and domestic service. Workman is pinpointing the location of a streetlight.

various types of plastics and fibreglass in an effort to find suitable material in which transformers can be enclosed and buried for many years.

While underground distribution has been a major factor in utility development in the last dozen years, the concept is far from new.

Bev Gill, supervising distribution design engineer for Ontario Hydro, says the provincial utility has had underground installations in some of its rural areas for about 30 years. In fact, he says, some very old underground services have since been replaced with overhead.

Because Ontario Hydro is not involved in providing service to urban areas, its involvement in underground distribution has been minimal. However, it does supply about 12,000 subdivision customers through underground services. A good number of customers have also asked and paid for underground service to their property from an overhead line.

Several municipal utilities have also had underground services for a considerable length of time. Ottawa is perhaps the outstanding example. Cables were placed underground near the Parliament buildings in the early 1900's. Niagara Falls and London were experimenting with underground services in 1948. Many of these early lines are still in use.

Harold Brownhill, manager of Niagara Falls Hydro, says the utility's first underground system was installed in 1948; the manager at that time was J.A. Williamson. Transformers were placed above ground and the primary cable was laid in a duct. Secondary lines were simply buried without the benefit of a duct.

"It was an experimental job and you have to give credit to Mr. Williamson for having the courage to proceed," says Mr. Brownhill.

Environmental considerations have undoubtedly resulted in an increased interest on the part of utilities in going underground. But the big bugbear remains cost. "While the trend toward underground can only grow, we've got to get to grips with the problem of overheads," says one utility punster. □



A surface pad-mounted transformer is connected to the underground circuits in a new subdivision.



Don Manion and Walley Zoellner at work in the control room of the International Niagara River Control Works, about half a mile above the falls. Along with fellow river control supervisor Ray Willis, the men lowered the level of the Niagara River to help save 10 lives.

BENDING THE RULES HELPS SAVE STRANDED TEN

by Rae Hopkins

There's a lot of truth in the old adage that rules are made to be broken. Even so, circumstances have to be unusual before a blind eye is turned on international treaties, although that's exactly what happened last fall in one of the most dramatic rescues in the history of the Niagara River.

Quick thinking and a studied disregard of the rule book by Ontario Hydro's river control supervisors, who maintain water levels from a control structure upstream from the Horseshoe Falls, saved 10 people from being swept over the 176-foot precipice.

Thousands of tourists watched the three-hour drama from both sides of the river as nine adults and an infant came within a whitecap of being washed away as one heroic rescue attempt after another went awry.

The tourists first saw two men and a woman standing waist-deep in the 20 mph current, crying out for help while their capsized 14-foot red runabout thrashed wildly among the cascades, then plunged to a crumpled wreck over the brink of the falls. One of the men was holding a small boy aloft.

Then onlookers saw a helicopter containing a pilot, two New York State parks policemen and the 18-month-old child, which had been passed up to them, crash into the fast-moving waters and explode. The helicopter's occupants were dumped into the river, but escaped injury in the flaming crash.

Next, the motor of a New York State parks police power boat failed in the threshing waters, forcing two of the crew to jump overboard. A third man attempted in vain to restart the engine and was forced to abandon ship less than 50 yards from the brink of the falls.

A human chain failed to reach the drifting policeman, but he managed to grab hold of the last tree branch before the precipice. The human chain then pulled him to safety.

The crowds saw the police boat plunge over the brink of the Horseshoe and they saw a special gun fire a series of ropes which eventually became a lifeline to the nine people in the vicinity of the downed helicopter.

Finally, they watched all of them, the child in the arms of one of the original helicopter passengers, wade slowly to safety attached to the rope. They cheered as willing hands pulled the rescued people safely ashore.

What the crowd didn't see, though, were the efforts of three unsung heroes working behind the scenes in the entire rescue operation. They were the river control supervisors on duty at the control structure which regulates the flow over the falls and the amount of water diverted for power generation at hydro-electric stations on both sides of the international border.

Few of the onlookers noticed the receding water level in the Grass Island pool in which the people were stranded. Nor would they have the slightest inkling that the flow over the falls had been cut by 2,000 cubic feet a second. The diverted water was passed through the generating stations of the Power Authority of the State of New York and Ontario Hydro.

Least of all, the watching thousands would probably never know that the river control operators violated an international agreement to bring about a successful rescue operation.

The first violation concerned the amount of water which is supposed to flow over the falls during the daylight hours of the tourist season. That flow must be maintained at a minimum 100,000 cubic feet a second. The next violation was the lowering of the level of the Grass Island pool by 1.8 feet. The water level is not supposed to be lowered by more than 1.5 feet in any one 24-hour period for power generation.

But they had no qualms about it. Ten lives were at stake.

For river control supervisors Don Manion and Ray Willis it seemed like the start of a routine evening shift. That's the way it was until they pulled into the parking lot and spotted the capsized red runabout and the four people in the water.

At first, the two men, together with Walley Zoellner whom they were to relieve, felt that action was unnecessary because they saw the rescue helicopter arrive. They changed their minds the minute the chopper crashed. At the time, they didn't give the occupants much chance—especially when they saw the group enveloped in a ball of flame.

"But when the smoke cleared, we saw that there were now six adults and a child in the water," Mr. Manion says, "so we immediately got on the phone and asked the Americans to start loading up their plants and made the same request of the operators of plants on the Canadian side. There was no hesitation from either utility.

"Of course, we knew that we would be violating the international treaty—but when someone's in trouble on that river, anything goes."

Mr. Manion added that "at no time did we have any concern about the violation. Our concern was for those 10 lives in danger of being lost."

Ron Yorke, supervisor of river control, had nothing but praise for the men in the control room. He's since attended meetings with representatives of both governments to explain the violations and hear even more praise for the calmness with which the river control people acted and the wisdom of their decision to divert the water.

"In effect, they moved the river over so the people could wade out," Mr. Yorke says.

He points out that river control supervisors have had at least 100 incidents where people come down beyond international navigation limits and "to almost instant disaster." But this is the most dramatic rescue he can recall.

Unfortunately, no one saw the boat above the dam until it was too late. "It's not our job to police the river," says Mr. Yorke, "but we've become accustomed to keeping a lookout for small craft coming close to danger." □

LONG-TERM EMPHASIS ON NUCLEAR-GORDON

Summary of a speech by Hydro General Manager D. J. Gordon to the Electric Club of Toronto.



D. J. Gordon

Ontario Hydro is in a favorable position to meet demands for electricity and its plans clearly indicate that it intends to stay that way, says General Manager D.J. Gordon.

Addressing the Electric Club of Toronto, Mr. Gordon said: "There are those who would interpret that remark as a continuing resolve to make something which is already far too big and powerful even bigger and more powerful.

"That sort of accusation, which is being levelled at Hydro with increasing frequency, is just plain garbage."

Mr. Gordon added that Hydro is getting bigger because Ontario needs electric energy for continued economic and social development. "And I don't hear many people advocating a slowdown or a reversal in the economic development of this province. If and when they do decide to slow it down, Hydro will adjust its load forecasts and plans for future capacity."

Mr. Gordon said the "dicey" primary fuel situation is giving Hydro increasing concern. "We have tried to hedge against these fuel problems by pushing forward to meet the approaching nuclear age and by maintaining as much flexibility as possible on the fossil fuels, coal, oil, and gas, to the extent of installing the capability of fuelling either with coal or gas at the Hearn plant and providing for the burning of either crude or residual oil at Lennox and Wesleyville.

"The recent deterioration with respect to oil supply has prompted Hydro to undertake a review of the fuel for Wesleyville.

"In the short and intermediate term, we will have to rely heavily on the flexibility which we are able to build into our fossil fuel supply; in the longer term just a short 20 years from now, 80 per cent of Ontario Hydro's electrical energy will come from our nuclear and hydraulic resources.

"When we reach the point where we can supply 80 per cent of our energy from indigenous fuel, Ontario is practically assured of essential electrical service under emergent restricted conditions.

"Ontario should, indeed, be thankful to the people who had the courage to push ahead with Candu," Mr. Gordon said.

He added that reading newspapers these days, people may have some difficulty understanding how Ontario Hydro could be in such good shape as compared with ominous warnings of brownouts and blackouts in some parts of North America.

"When we come to the assistance of our neighboring utilities, which have come to our assistance in the past, we are criticized for polluting instead of being given 'brownie points' or a pat on the back."

Outlining the problems of securing a right-of-way for an extra-high-voltage line between the Nanticoke and Pickering generating stations, Mr. Gordon said the most acceptable route recommended by an independent consultant to the Solandt Commission from an environmental viewpoint is one which is an adjunct of the proposed parkway belt, running north of Toronto.

"However, if the final decision is for the parkway belt, the extra price tag is at least $66 million over the $298 million which Hydro estimated as the cost of our preferred route," Mr. Gordon said.

"If delays in 500-kV transmission lock in generation at Bruce, we have an out-of-pocket expense of $250,000 a week to replace 350 mW of the first Bruce unit with fossil-fuelled generation, and $800,000 a week in down-the-drain fuels costs if locked-in capacity is extended to two units.

"So we will probably end up on the parkway belt at a substantial extra capital cost, at a nominal increase on Hydro bills —and, hopefully, without interruptions to service. I said hopefully because, let there be no mistake, there are increasing risks of interruptions to service and risks of the approaching dark age in 1977 or 1978 as the days, months, yes, even years now, of indecision with respect to that particular 500 kV right-of-way continue," Mr. Gordon said.

And he added: "That is just one project. Think of the environmental flack Hydro is going to fly through in locating another 1,000 to 1,200 miles of 500-kV line in Ontario in the next 10 years, in locating new generation on new or existing sites, in placing additional heavy water plant in service in order to stay on the nuclear course.

"However, lessons have been learned from the Solandt Commission —certainly by Hydro, and I think by the government and the public as well."

on top of the job

The view from the top hasn't changed drastically for linemen in the London area, but their observation post has.

Working 75 to 135 feet above a subdivision in the city's southeast sector would be commonplace—except that the standard lattice-type tower carrying a single-circuit, 115,000-volt transmission line has been replaced by a steel pole, double-circuit, 230,000-volt line.

Introduction of new-look poles required the development of new techniques in live-line maintenance, the method by which transmission lines are serviced



The introduction of improved appearance transmission lines requires the development of new techniques in live-line maintenance.

without cutting off the power. The crews who will be undertaking the live-line maintenance work were given special training in the new techniques and tooling required for these new-look poles. Tony Jerschow, project engineer—line maintenance department, who directed the training, says that it will help to form the basis of new live-line work methods and procedures for these types of structures.

Chiefly for aesthetic reasons, Ontario Hydro has been studying tapered tubular steel-pole construction for high-voltage transmission lines for some time, but the single poles will also accommodate a double-circuit, 230,000-volt line on a narrow right-of-way—something the conventional lattice-type towers cannot do. In fact, the right-of-way traversing the London subdivision is only 66 feet wide.

"We wanted to make the new line acceptable to residents in the area and hoped the steel pole would satisfy both the aesthetic and engineering requirements," says E.M. Wadge, supervising project engineer.

The line, which runs about four miles between the Highbury and Clarke transformer stations, affects a half-mile of subdivision. The only conventional towers along the right-of-way are on a short stretch between Highbury transformer station and the residential area.

Mr. Wadge estimates that a new-look line costs at least 50 per cent more to install than a line of lattice-type towers. "Installing improved-appearance structures isn't something we can do everywhere, although urban residential areas and key industrial parks will get priority consideration."

One of the main reasons for the new





Live-line maintenance techniques are practised on new-look transmission towers, which run through a London subdivision. Single-pole towers carry 230,000-volt line on narrower than usual right-of-way.

line was that the former 115,000-volt line was inadequate to meet London area demands. The 230,000-volt line will carry more than four times as much power. The new-look structures were designed and built by Hawker Siddeley Canada Limited's Canadian Bridge division.

R.G. Wykes, Hydro's transmission and distribution design engineer, says the specifications called for a single pole and listed the conductor spacings required, tower height, and wind and ice-loading the line would be expected to withstand. "The main thing in single-pole design is the shaft and arms," he says. "Under maximum wind conditions, the top of the tower will bend 10 feet, which makes it much more flexible than the standard lattice-type structure."

The octagonal-shaped poles fit together in sections. On the Highbury-Clarke line, the poles are painted an off-white and the insulators are a sky-grey.

A recent poll taken among 2,000 adults across the U.S. by Meyer Industries, Inc., of New Jersey, showed that utility structures were not a matter of major concern as a source of "visual pollution." Indeed, only 12 per cent of the respondents considered transmission line structures unattractive. Transmission towers fell far behind litter and trash, which 70 per cent of the respondents deemed to be eyesores, poorly paved streets, (49 per cent), junk yards (48 per cent), and signs and billboards, (28 per cent).

When asked to indicate a preference between the new-look steel pole or the conventional lattice type of transmission structure, 67 per cent selected improved appearance poles. □





by Sheila Kenyon

Some experts are predicting the pipeline transportation
western coal and lignite well before the year 200
Sulphur, iron ore, lead, zinc and copper concentrates, aluminum ar
wood are also likely candidates for pipeline technolog

Overleaf: largest diameter oil pipeline in the western world is shown under construction near Edmonton in 1972 for the Interprovincial Pipe Line Company.

Before the year 2000, a variety of commodities from aluminum and wood to asbestos and sulphur may be crossing Canada... underground. We already have the western hemisphere's longest pipelines carrying oil and gas. Within 10 to 15 years, Ontario could receive coal from Alberta and lignite from Saskatchewan transported through underground pipelines.

The spur for this development stems from a number of factors: rising transportation costs and congestion at ports and depots, concern about the environment, uncertainties about imported fuel supplies and the remoteness of some of Canada's newly discovered resources.

The technology for transporting solids by pipeline already exists. One system under investigation by the Saskatchewan Research Council involves the suspension of solid particles in a liquid. The two materials, for example, coal particles suspended in crude oil, could be moved through a pipeline and separated at the other end. Slurry pipelining, as the method is known, is already in commercial use outside Canada.

The Alberta Research Council is studying the pipeline transportation of solids in the form of a cylinder or sphere carried by a liquid. However, such capsule pipelining is not nearly as advanced as slurry pipeline techniques.

Some experts are highly optimistic about the early introduction of solids pipelines. Gary McLaughlin, senior transportation analyst for the Canadian Transport Commission, says Canada has the expertise to become the first country in the world to pipeline coal for steel-making, potash and sulphur. And Dr. W.H. Husband, of the Saskatchewan Research Council, predicts: "Long-distance slurry pipelines will be transporting Canadian resources to ports and industrial centres within the next 10 years."

Making the right decisions, especially in the pipelining of fuels, could be extremely important to Ontario. Adequate, reasonably priced energy is vital to the province's industrial base. In 1970, Ontario had to import 80 per cent of its energy requirements. Western oil and gas accounted for a substantial portion of fuel imports. As world prices for these commodities rise, the prospects for Western coal look increasingly inviting.

But there are strong differences of opinion as to when pipelines to carry solids such as coal would become economic. Although the technology exists, the initial costs would be high and slurry coal may present storing and handling problems, particularly in winter. Some people feel that conventional transportation will be cheaper than solids pipelines for some time to come. The trick is to make transportation decisions well ahead of the need, since it takes several years to build pipelines and their backup facilities.

Experience has shown that energy requirements often outstrip expectations. In the 1950's, when the TransCanada pipeline brought natural gas into the St. Lawrence lowlands, Canadians were worried that the market would not develop rapidly enough. Yet, within a few years, continuous exploration and development of natural gas reserves were essential to keep up with demands.

Long-term supply and marketability are important factors in the introduction of solids pipelining. Over the last decade, several schemes for solids pipelines have been mooted. None has got further than the planning stage. The plans proved uneconomic because potential markets were not forthcoming.

G.H. Durham, manager of engineering for Shelpac Research and Development, says: "In spite of the generally favorable legislation and resolution of most of the technical questions, slurry pipelines have not yet become a part of the Canadian transportation system. This can be attributed entirely to the lack of economic incentive." Shelpac is jointly owned by Shell Canada and Canadian Pacific.

It's quite possible, though, that the general tightness of energy supplies and the insecurity of Middle East oil may give early impetus to the development of solids pipelines.

Eastern Canada's need for Western coal and oil became apparent last year with the abandonment of the policy under which Western oils stopped short of the Ottawa Valley and all the refinery needs of Quebec and the Maritimes were met by imports from the Middle East, West Africa and Venezuela.

Among the pipeline schemes proposed in Canada to date is a $200 million project by Cascade Pipe Line to transport a coal-water slurry 490 miles from the East Kootenay coalfields to the port of Robert Banks, near Vancouver. Development of the system would depend on coal sales to Japan and other overseas markets.

About the same time, Shell Canada spent more than $1.7 million studying the feasibility of piping slurry sulphur 700 miles from Alberta to the west coast. The line would cost about $60 million.

The latest slurry pipeline proposal examines the feasibility of transporting coal in oil from Alberta to Ontario. Preliminary investigations were carried out by Shelpac on behalf of Interprovincial Pipe Line, and the idea is to use IPL's existing facilities.

Shelpac's report indicates "that Alberta coals delivered in the east in an oil-coal slurry by IPL systems may be only marginally competitive at current fuel prices. The major factors affecting viability of the concept are the relatively long-term escalation of fuel prices and the availability of other energy sources."

IPL is interested in supplying Ontario Hydro, Commonwealth Edison in Chicago and two other power companies in Michigan. Hydro has the proposal under study, although even the pipeline company remains cautious about the idea. Considerable research remains to be done, says IPL. Coal deliveries could not start before 1977 and "true viability will depend on the competitive environment in the period 1977 to 2000."

"The main advantage of pipelining compared to other methods of resource transportation is that the bulk of the transportation costs is unaffected by inflation," says R.L. Cohen, a Hydro supply resources engineer.

"There are several disadvantages offsetting this and our ability to minimize these disadvantages will determine the





Oil is pumped east from the Alberta oilfield through the Interprovincial Pipe Line Company's system



future of slurry pipelines for the Ontario Hydro system."

Use of Alberta coal may be imperative to Ontario in the light of the energy crisis. Last June, Energy Minister W. Darcy McKeough suggested that Ontario should assist in the development of policies and technology that might enable Alberta coal to be delivered to Ontario by rail or slurry pipeline at a cost competitive with present sources.

Coal plays a vital role in the operations of Ontario Hydro, which in 1972 burned 8,400,000 tons imported from the U.S. In fact, Hydro's requirements account for about half Canada's total coal imports.

Western lignite has already been used in the Thunder Bay thermal-electric station on an experimental basis, but it has a number of serious disadvantages. Lignite's high water content adds to transportation cost, lignite produces much less heat than the equivalent amount of steam coal and its large-scale use would involve considerable modifications to Hydro's existing steam plants.

Rather than depend entirely on imported supplies, however, Hydro is now looking at the burning characteristics and transportation problems associated with various types of Western Canadian coal with a view to negotiating long-term contracts. The immediate form of transportation foreseen is by rail to the Lakehead and then by boat.

Should Canada decide to go ahead with slurry pipelining, she will not be breaking new ground. Solids pipeline systems have been operational in other

parts of the world for several years. The largest operating line is the 18-inch diameter, 274-mile Black Mesa line, which carries 5 million tons of coal annually across Arizona to the 1,500-megawatt Mohave power plant in Nevada. Mohave uses 660 tons of coal daily. To ensure supply, a 35-year contract was signed. The cost of the pipeline system, which included terminal storage facilities and a dewatering plant, was approximately $36-million.

Another U.S. pipeline carries gilsonite, a pure asphalt used in the manufacture of paint, about 70 miles from Bonanza, Utah, to Grande Junction, Colorado.

Other slurry pipelines ranging in length from three to 200 miles operate throughout the world carrying a wide variety of commodities: phosphate (Florida), coal slurry (France), limestone (England, Columbia, Trinidad), gold tailings (South Africa), copper tailings (Japan). The Japanese system moves highly corrosive sulphide ore through almost inaccessible countryside.

Solids pipelines could be used to transport natural resources from remote areas of Canada to processing plants. In Tasmania, Australia, a 9-inch diameter, 53-mile pipeline transports ore from the isolated interior to the coast. The $80 million project opened up mining facilities that had waited a century for full-scale development.

Canada is ideally suited to solids pipelining, says Michael Charles, a chemical engineering professor at the University of Toronto, because large quantities of raw material will have to be moved over terrain not serviced by conventional transportation systems.

Looking to the next century, capsule pipelining may have an important transportation role. Already, considerable funds have gone into capsule pipeline investigations at the Alberta Research Council's development centre. The research is sponsored by the Transportation Development Agency, a branch of the Federal Ministry of Transportation.

The concept of moving products and material by capsule pipeline provides great versatility. Raw materials may be melted down into capsule form and transported with or without a protective coating, depending on whether the solid contaminates the carrier liquid. Alternatively, the capsule may consist of a plastic or metal container for the solid, or the solid itself may be mixed with a liquid to form a paste slug. The liquid forming the paste and the pipeline carrier liquid are immiscible.

Coal, sulphur, potash, gypsum, iron ore, solid waste, lead and zinc concentrates, copper concentrates, asbestos, aluminum and wood are all potential capsule commodities.

Ontario Hydro researchers are working on an underground pipeline that will carry —wait for it—high-voltage electric power. Acronymed DAMUT (ducted air medium underground transmission), the project consists of a large air-cooled duct with three aluminum tube conductors supported inside. Preliminary studies indicate that DAMUT might cost three times as much as an overhead transmission line of similar capacity and length.

Future deliveries of natural gas to Ontario may some day depend on the result of research 3,000 miles away in the Arctic. Researchers in the far north are designing a 48-inch diameter pipeline system to be operated with a minimum of damage to the permafrost and fragile northern environment. Natural gas may be chilled to nearly the temperature of the frozen ground so that it will not melt the permafrost.

Canadian Arctic Study Limited and the Alaskan Gas Study Company are spending $25 million on preliminary research into the system.

At present, the most abundant fossil fuel is coal with more than 90 per cent of the country's reserves in Saskatchewan, British Columbia and Alberta. It is estimated that Alberta alone could supply Ontario for 200 years. Ontario itself has reserves of lignite in the Onakawana deposits, near Moosonee.

"The development of frontier resources of oil and gas are essential for Ontario in the future because the outlook for supply from conventional sources in Canada is limited. The question is one of timing and method," said the Ontario Government's Advisory Committee on Energy.

It may be that pipelines will play a significant role in this development. □

sound way to reduce



Ontario Hydro has a problem most fishermen would envy—too many fish.

It seems that fish of all sizes, shapes and varieties insist on sticking their noses where they don't belong, in the intake channels and tunnels at generating stations. The situation has been under investigation for several years, but a recent study, sponsored by Hydro, has shed some new light on the problem.

The research project was carried out for Ontario Hydro by Lieutenant-Commander Stan Buxcey, an expert in the field of underwater propagation of sound waves, and Dr. Tom Malar, a fish behavior specialist.

Cmdr. Buxcey is an associate professor of electrical engineering at the Royal Military College, Kingston, and Dr. Malar was formerly a research assistant with the Institute of Life Science, Texas A and M University. Ray Effer, supervisor of environmental studies in the generation concept department, acted as supervisor of the project for Hydro.

Early last summer, a site for the study was selected at the western end of East Lake in Prince Edward County, and a 20 x 5 x 6-foot net-and-wood frame enclosure was set up. A closed-circuit television camera was mounted on top and equipment was installed to record fish behavior.

Then fish, which had been caught in trap nets and released into the cage, were subjected to underwater sound waves at different frequencies and intensities.

Since nobody really knows what sounds fish will respond to and what they will not, frequencies ranging from 115 hertz to 200 kilohertz were used. By way of comparison, sounds audible to the adult human ear range from 20 hertz to 2(kilohertz.

During past experiments, fish behavior experts have found that a fish's swim bladder seems to control its response to underwater sound. Sound waves resounc inside the bladder, causing it to vibrate. So Cmdr. Buxcey reasoned that there ought to be a particular frequency, the "resonant frequency", which would mak the vibration uncomfortable for the fish and cause it to move away from the

intake of alewives?

Hydro's problem is too many fish.

by Lois Wallace

source of the discomfort.

From the results, Hydro's environmental studies group hoped to be able to develop methods of repelling fish from shoreline and underwater intakes. But fish aren't exactly co-operative. They come in all shapes, sizes and varieties with all sorts of different habits and all sorts of different swim bladders.

Observation of fish movement in response to sound proved difficult and interpretation of that movement even more so. The experiment had to be carried out in a fairly open location to keep the sound from reverberating off foreign objects. But the open lake location brought a great many other factors into play—changing light conditions, water conditions and the weather.

Hurricane Agnes did her bit to complicate things for a few days by causing electrical static which interfered with the TV monitor.

Despite the problems, groups of pickerel, sunfish (with some black crappie and rock bass) and alewife were exposed to sound at different frequencies. The resonant frequencies of the fish were discovered and used as guidelines in selecting frequencies for further experiments.

Results obtained from tests on the pickerel, sunfish, crappie and bass were inconclusive, but experiments with the alewife, a very active schooling fish, proved more encouraging. With the introduction of 1,200-hertz sound there was an indication of school breakdown, and during 2,000-hertz sound there was a decrease in school movements.

The response of the alewife schools to those frequencies could prove extremely important, since alewife cause many of the problems in Hydro's cooling water intakes. But before results of the study can be applied, further experiments will have to be carried out, possibly in the intake or discharge channel of a generating station, and more sophisticated, efficient monitoring equipment will have to be used, Ray Effer explains.

Meanwhile, several other methods of diverting fish are being tried out. Electric screens and air bubblers have been tried by different groups in attempts to keep fish out of water intakes for power plants, municipal water supplies, steel mills and other industries. Even rock and roll music has been suggested as a diversionary tactic.

Intake design also has a bearing.

For example, the inverted saucer-shaped intake structure designed to serve the first four units at Nanticoke, converts the vertical current, undetectable to fish, into a horizontal one, from which they can steer clear.

Approach velocity of the intake water at all stations is kept at or below one foot per second, but weak or slow-moving fish can still be carried into the cooling systems.

Detailed records are kept of the numbers of coarse fish, such as alewives; commercial fish, like perch and smelt; and game fish, such as trout and bass, found in the intakes at stations. And it has been found that the greatest intake occurs during a few weeks each spring in the spawning period.

Possible solutions to the problems are as diverse as the problems themselves. Variations in intake design, patterns of underwater currents and the habits of lake fish contribute to the difficulty.

The problem is not simply an operational one, but an environmental one as well and while results of the latest study look promising, there is much work yet to be done. As Ray Effer says: "We are still open to suggestions." □



Fish have an affinity for the areas of relatively warm water in the immediate vicinity of power plants, as these young anglers at Lakeview generating station, left, and Douglas Point, above, well know.

BANKING ON THOSE ENERGY BILLIONS

by Bob Morrow

There's a growing consensus that major energy projects contemplated in the next two decades can be financed without undue strain and that most of the financing can be provided by Canadians.

Newspaper, radio and TV ads are making people aware that Hydro is promoting wise and efficient use of energy. Equally important but less apparent is Hydro's increasing emphasis on long-range planning to control costs and conserve dollars through prudent financing.

On the broader front, billions of dollars are required for proposed Canadian and U.S. energy projects and financial questions cut across the entire economic scene. Underscoring these questions are possible energy shortages, rapidly rising fuel costs and environmental outlays.

Middle East crises, political hassles over energy policy, and talk of fuel rationing create confusion about the short-run supply situation, but one thing is clear: in the long run, no country can afford to overdraw its bank account—whether it be dollars or BTUs.

Canada's energy supplies are more than adequate to supply its own needs but they are unevenly distributed, mainly in Western Canada and the Arctic, and require development on a large scale.

Thus a major question involves the availability of capital to finance projects such as frontier oil and gas wells, the proposed Mackenzie Valley pipeline, the Athabasca tar sands, the James Bay hydro-electric development and nuclear power plants. Coal gasification may create the need for additional funds.

A two-volume energy study by the federal government says capital expenditures for energy development in Canada are expected to range from $42 billion to $68 billion during the 1970's. The actual amount depends on five possible rates of development, ranging from mere national self-sufficiency" to "maximum development" to generate as much income as possible from resource development.

The study concludes that a moderate-based $50 billion program "could be absorbed, if there is moderate slack in the Canadian economy, without major consequences."

A $60 to $68 billion program, however, would have to be accompanied by stringent monetary and fiscal restraints with a re-ordering of economic and social priori-

Pickering 1
$746,000,000



Bruce 1
$1,298,000,000



ties," says the report.

A consensus seems to be growing, though, that major energy projects contemplated in the next two decades can be financed without undue strain and that most of the financing can be provided by Canadians. Such opinion is a result of studies undertaken by the provincial and federal governments and financial institutions.

In a speech to the Canadian Gas Association, Allen T. Lambert, chairman and chief executive officer of the Toronto-Dominion Bank, said the major energy projects appear larger than life only when viewed in the context of Canada's present economy.

Expansion of existing facilities and other energy-related spending should bring total industry commitments to between $50 billion and $60 billion in the 1970's, he estimated.

By comparison, the value of the gross national product in the same period will rise to more than $200 billion with a savings-generating capacity of $40 billion to $50 billion a year from all domestic sources.

By the end of the present decade, the Canadian economy will be twice its present size with corresponding increases in its ability to generate capital.

Mr. Lambert said the evolving fiscal strength of Canadian financial institutions could best be shown in the fact that approximately $750 million was raised 20 years ago in public and private issues compared with the annual $5 billion to $7 billion in the past two years. The gross national product rose from $25 billion to more than $100 billion annually in the interim.

Ontario's Advisory Committee on Energy has also analyzed the capital requirements for all of Canada's energy industries from a broad financial viewpoint.

The committee estimated requirements of $60 billion for the rest of the decade, of which roughly half will be needed by the electric power industry for generating and transmission facilities. The balance will be required by the petroleum and gas industries.

The committee pointed out, however, that an estimated 30 to 40 per cent of the gross amount will be generated internally by participating companies. "Applying a 35 per cent ratio to the $60 billion estimate reduces the requirement to $39 billion," says the report. This net amount would average about 3.6 per cent of the gross national product, the sum total of all goods and services produced in Canada.

Dovetailing with the ACE study, Task Force Hydro examined the implications for Hydro between 1971-91, including the availability of capital, alternative procedures for raising it and possible constraints.

The task force concluded that Hydro's demands for savings in the next two decades will, on the average, be a higher percentage of the funds available than in the 1951-70 period and that Hydro could also expect that other sectors of the economy will increase their relative demand for funds. Both factors could complicate Hydro's financing programs.

The task force suggested that in view of these facts, Hydro may have to re-examine its internal financial policy and the design, mix and marketing of its securities in Canada.

Among its specific recommendations, the task force proposed that Hydro take steps to protect its favorable credit rating by preventing any further increase in its debt-equity ratio. Such steps would include the raising of additional funds through rates. The traditional provincial guarantee on Hydro bonds would be retained to minimize interest costs.

Ontario Hydro is making plans in co-operation with the Ontario Municipal Electric Association to stabilize the debt-equity ratio and raise a limited amount of additional funds through rates. The effects will be to protect Hydro's credit rating, thus heading off higher interest rates, and to reduce borrowing. The 1974 rate increase includes the provision of additional revenue to reduce borrowing for system expansion.

A recent Hydro projection indicates that Hydro's annual borrowings will exceed the $1 billion mark within the next few years. Why are these funds needed?

By its very nature, the electric utility industry is uniquely capital-intensive. It requires almost $5 of plant investment for each $1 of annual revenue—about 10 times as much as the invested capital required by the average industrial corporation to generate the same amount of revenue.

In Ontario Hydro's case this trait has been magnified by the stepped-up nuclea power program announced last June. Although fuelling costs are low, Canadian nuclear plants require significantly larger infusions of capital than fossil-fuelled plants, which involve relatively low capital outlays but escalating fuel costs. Once built, however, nuclear plants are relatively inflation proof because of reasonably stable costs.

Hydro's current expansion program, which has been approved in principle by the provincial government, is predominantly nuclear. It includes the doubling o the Pickering and Bruce nuclear power stations, a nuclear station near Bowmanville and a large plant at Wesleyville, near Port Hope. In addition, more fossil-fuelle generation will be required in Northern Ontario.

In all, the new facilities will provide an additional 10,000 megawatts by the mid-1980's to meet power demands which have been doubling every 10 years.

Nanticoke
$755,000,000



To ensure adequate supplies of heavy water—an essential ingredient in Canadian nuclear plants—Hydro is buying the 800-ton-a-year Bruce plant from Atomic Energy of Canada Limited and plans to build a second plant of similiar capacity at the same Lake Huron site.

Additional heavy water facilities will be required to meet Hydro's needs and in recent speeches Energy Minister Darcy McKeough has been urging private companies to build them to reduce Hydro's financial burden and to encourage "free enterprisers in Canada who are really enterprising."

The importance of nuclear power to Ontario, which imports 80 per cent of its energy needs, has been underlined in a special Task Force Hydro report and by Chief Engineer Harold Smith.

"Uncertainties and shortfalls in imported energy resources will almost certainly mean increasing emphasis on the use of indigenous resources," said Mr. Smith. "In Ontario, the only substantial, unused energy resource we have is uranium—and the only practical technique for its use, at least for many years to come, appears to be through conversion to electricity.

He adds: "Great emphasis must be placed on increasing use of uranium, not only because it is less subject to price increases, but, even more important, in the event of a primary energy shortage it offers Ontario maximum security."

In addition to its major construction program, Hydro faces a number of problems that are shared generally by the electric utility industry and may affect its financial viability.

U.S. electric utility spending to 1977, for example, will be nearly double that of the previous five years, heightening competition for funds in the U.S.

Utilities on both sides of the border are beset, too, by inflation, environmental protection costs which cut into revenues and, in some cases, adverse investor reaction to utility stocks and bonds. Unsettled financial markets, currency fluctuations and fuel supply problems add to these headaches by introducing uncertainties

Lennox
$373,000,000



which weaken investor confidence.

Charles A. Benore, of Salomon Brothers, a prominent New York City investment firm, stressed the need for adequate earnings to attract capital in a talk to U.S. utility executives on "Financing the Future."

"In my opinion," he said, "it is vital for managements of the electric utility industry to exercise every reasonable opportunity to increase internal cash generation."

The American investor's attitude toward Hydro bonds, which are traditionally issued on its behalf in the U.S. by the provincial government, is an important consideration. At present, Hydro bonds have an "AA" rating on the U.S. market—the best credit rating possible for any non-American organization.

Last October, the province issued $125 million in 30-year bonds on the U.S. market on Hydro's behalf, the largest such offering in history. Bearing a 7.9 per cent interest rate, the issue was taken up by 46 underwriting firms in six major U.S. cities.

This reception indicates that Hydro bonds enjoy wide acceptance in the U.S. and, of course, Hydro would like to keep it that way.

Large as the U.S. issue appears, Hydro raised a total of $535.4 million in debentures last year in Canada ($375 million), the U.S. ($125 million), and West Germany ($35.4 million) to meet capital expenditures which are estimated at $725 million.

The 1973 financing is in accord with Task Force Hydro's proposal to develop the Canadian market for funds.

Hydro's objective is to obtain funds at the lowest possible rates, over the longest term to maturity. During last year's progressively tighter monetary climate, interest rates paid by Hydro ranged between 6-1/2 per cent for the West German loan and 8-1/2 per cent for a $50 million Canadian issue in November.

Indicating a flexible approach, maturities for the eight bond issues were five years, 10 years, 25 years (three issues totalling $275 million), and 30 years. In addition, Hydro continued to use provincial government authority to issue short-

erm notes, ranging up to three years, with maximum limit of $250 million.

This year, borrowing will likely be even eavier to raise a large share of the $875 illion that will be required for the capital onstruction program.

With the growing need for capital, ydro is concerned not only with the vailability of money but also with interest osts. Treasury division estimates that the ifference between paying 8 per cent and -1/2 per cent on a 25-year $100 million ond issue involves an initial saving of bout $5 million.

Since timing of bond issues is crucial in etting the most favorable rate, treasury fficials keep finely tuned to financial arkets in Canada, the U.S. and Western urope on a day-to-day basis, either irectly or indirectly through investment yndicates.

At present, Hydro's foreign borrowings now substantial gains as a result of inter- st rate differentials which existed when ese issues were floated and subsequent uctuations in the values of the U.S. ollar, the West German mark and the wiss franc relative to the Canadian ollar. The favorable fluctuations of the .S. dollar have far outweighed the dverse movement of the two European urrencies.

The West German issue is one of everal that have been floated there since 969. Examples of other foreign sources hich may offer potential in the years ead include the Japanese and the ench markets.

One of the financial objectives oposed by Task Force Hydro is "to ance capital facilities at the lowest cost nsistent with a financially sound opera- n."

Two related matters are "make or buy" licy and Hydro's return on invested pital.

Task Force Hydro's final report on "make or buy" policy, released in December, calls for more contracting out by Hydro to generate the best economics for both Hydro and the province. Such a move would be in line with the trend among private companies to reduce capital investment by leasing facilities and equipment.

To ensure its financial viability, Hydro needs more internally-generated funds which must be achieved through rate increases. The result of these increases will be a higher rate of return on Hydro assets and reduced borrowing.

This policy is in line with Task Force Hydro's proposal that rate of return on Hydro assets be used as a measure of the efficiency with which capital resources are employed.

The task force pointed out that a 1 per cent increase in rate of return would raise $2.3 billion from 1972 to 1991, which would permit a 10.5 per cent reduction in Hydro debt issues.

The task force said the rate-of-return yardstick would enable Hydro to present a clear picture of its financial position in competitive capital markets. It would also be useful in connection with the new public rate review process scheduled to start this year and in helping government to monitor allocation of capital resources in the provincial energy field.

In this era of inflationary pressures, price escalation for new facilities, the requirement to increase generating reserve margins for an expanding power system, and rising rates, Hydro is placing emphasis on controlling costs. By cost control, Hydro can reduce its dependence on borrowed funds and keep a tight rein on rate increases.

Looking to the future, Hydro's broad financial policy will be of great interest to the associated municipal electric utilities and to the provincial government. New features will be closer consultation with provincial government authorities and public participation in rate reviews.

Hydro is gathering material for rate review hearings this year at which financial policy, including proposed rate increases, will come under more intense scrutiny than ever before. But, considering the rise of consumerism and increased government regulation of private enterprise, that's what a public corporation like Hydro must prepare for in the 1970's.

Premier William Davis, in a statement to the Legislature last June announcing plans for electricity rate reviews, pointed out that "the seriousness of a real crisis in energy—whether this relates to supply or price—is difficult to exaggerate.

"Energy is crucial to our industries and to the employment of our people," he said. "It is a vital necessity for the physical comfort and well-being and, indeed, the physical survival of the people of Canada."

Taking a long-term view, the federal energy study predicts that electric energy could provide 90 per cent of all energy needs in Canada by the year 2050. Electricity will undoubtedly be used extensively to provide power for rapid transit, recycling, waste treatment and other environmental programs.

From these perspectives, the financial soundness of all electric utility systems is essential if they are to fill their future roles. □

along hydro lines



Link with past

A link with Canada's electrical past, Electrical News & Engineering magazine, ceased publication with its October, 1973, issue.

Electrical News & Engineering served the electrical industry continuously from 1891, participating in its phenomenal growth from the early days of electric power.

The magazine has witnessed and, on occasion, helped institute dramatic developments and engineering breakthroughs. Unfortunately, from the point of view of advertising revenue, it has also presided over a decline in the number of corporations serving the electric power market and the consolidation of electric systems into provincial bodies.

Southam Business Publications, publishers of the journal, say the past several years have shown "a decreased interest by all but a handful of suppliers in communicating with the electric power market and the electrical engineer via a specific publication directed to this group...

"It is, therefore, with great regret that we are compelled to announce termination of the publication."

Lower Notch dedicated

Ontario's Energy Minister, Darcy McKeough, has officially dedicated the 228,000-kilowatt Lower Notch generating station on the historic Montreal River, south of Cobalt.

During the construction of Lower Notch, two small plants, Upper Notch and Fountain Falls, were removed from service, dismantled, and now lie beneath the waters of the new headpond.

Acres Consulting Services Limited, Toronto, took charge of the engineering and site supervison of contractors engaged to build the station.

The main dam is an earth-and-rock-fill structure, 2,200 feet long and 180 feet high, spanning the Montreal River Valley about a mile upstream of the river's mouth. A 3,500-acre headpond was cleared of trees and other growth to create a lake extending 14 miles upstream.



At the unveiling . . . Ontario Hydro's First Vice-Chairman D. Arthur Evans, Chairman George Gathercole, W. Darcy McKeough and Edward M. Havrot, MPP, Timiskaming.

The river and gorge have a long and colorful history. Archeological discoveries place it as a camping ground for Indian tribes at least 5,000 years ago. A trading post was built beside the river in 1679 by the Company of the North, which was absorbed by the Hudson's Bay Company in 1821. The post was washed away by flood waters in the 1880's.

In the early 1900's, prospectors found rich veins of silver in the ground near Cobalt. In fact, the Lower Notch dam contains some ore from the tailings of abandoned mines nearby.

Convention '74

Delegates from across the province are expected to attend the Ontario Municipal Electric Association—Association of Municipal Electrical Utilities annual meeting at Toronto's Royal York Hotel, March 3-6.

While program details were not completed at press time, it was learned that among the highlights of this year's convention will be a review of Ontario Hydro's new approach to marketing by H. K. Wright, director of sales, J. J. Duran director of public relations, E. G. Bainbridge, director of consumer service, and L. T. Higgins, economist in charge of load forecasts.

It's hoped that a discussion will be held on the concepts of work-time managemer and, during the second afternoon, OMEA delegates will hear a report on the association's submission to be made to th Ontario Energy Board concerning the Hydro rate review process. The report will include the OMEA's views on expansion, financing and rates.

Many of the resolutions passed at distri meetings across the province will be brought to the floor for delegate approval

Will look at rates

Government lawyer Stephanie J. Wychowanec and three men have been named the Ontario Energy Board. Premier Willia Davis, who announced the appointments has promised that more women will be appointed to government boards and commissions.

The three appointments increase the board's membership to nine.

Miss Wychowanec, who will be one of the board's six full-time members, was a senior solicitor in the provincial treasury department. Another new full-time member is Donald R. Eldon, an economi and former vice-president of Lakehead University.

New part-time members are Toronto lawyer J.A. William Whiteacre and Toron consulting engineer A.J.G. Leighton.

The board, responsible for the regulation of the natural gas industry, will have the additional job of holding public reviews of all proposed rate increases by Ontario Hydro.

Thermal school

Ontario Hydro is establishing a thermal training centre to meet the increasing demand for highly-skilled personnel at its thermal generating stations.

With seven fossil-fuelled plants now in operation and others planned, training needs have outgrown the facilities available at Hydro's Conference and Development Centre in Orangeville.

"If our future manpower requirements are to be met," says Ed Holdup, manager of thermal operations, "we will have to encourage present staff to seek higher levels of skill and knowledge. By the end of 1983, our staff is expected to have increased about 75 per cent to 3,348. We have to be ready to meet that demand and do it in a structured, well-organized fashion."

Until the decision to establish a thermal training centre, thermal operations provided only the initial training for auxiliary plant operators through on-the-job training and classroom lectures. Progressions to auxiliary turbine boiler operator, turbine boiler operator and shift supervisor were left largely to the initiative of the individual, coupled with on-the-job training.

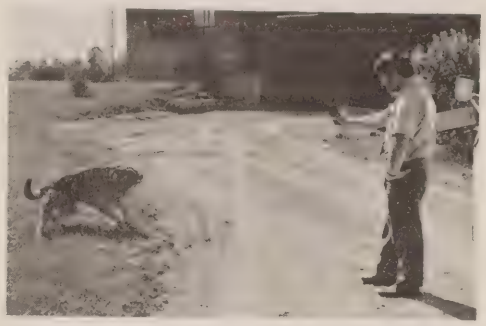
With the new training program, Hydro hopes to give staff an extra incentive to improve its skills. Jack Savory, station manager at the Lakeview thermal-electric plant, will be manager of the new centre.

Fido's tune

A dog, it's been said, is man's best friend. That may very well be true—until someone attempts to intrude on his domain.

Utility meter readers are often in that unenviable position and have been subject to unexpected attacks from dogs for years. But now some measure of protection may be available.

A new ultrasonic unit is being tested by meter readers from several municipal utilities and Ontario Hydro. The unit produces sound in the 18,000-Hz range—a frequency inaudible to humans, but extremely audible to dogs. At a distance of two feet or less, the device produces a sound intensity that approximates the sound level near the tailpipe of a jet engine. This is, understandably, extremely uncomfortable for the canine set and the dog backs off.



Nice doggie

While use of the device may produce momentary pain for the attacking animal, it does not harm the dog in any way.

Two North York Hydro meter readers have been testing the device for some time and neither of them has experienced a rip off—to the seat of his pants, that is.

Fusion probe

The first stage of a study to determine the possibility of establishing a Canadian program to control nuclear fusion has been authorized by Jeanne Sauve, Minister of State for Science and Technology.

"Ability to produce power from nuclear fusion would be a partial—but far from negligible—solution to the problem of rapid depletion of fossil fuels such as petroleum and coal," Mme. Sauve says.

The study will identify the options open to the government and the consequences of each option. This phase is expected to be completed in the fall.

If the study indicates that Canada should become active in research into controlling nuclear fusion, recommendations will be made to the ministry on the best program, financing, and organization to carry it out.

"Nuclear fusion will not only be almost inexhaustible, but it will also make it possible to reduce most of the undesirable effects on the environment caused by present sources of energy," Mme. Sauve adds. "Furthermore, it will contribute to the solution of several important future problems of society such as the depletion of primary materials and the accumulation of waste products.

"Success in controlling nuclear fusion and building thermonuclear fusion reactors would mean development of new technologies and lead to the creation of new secondary industry," she says.

Zoo line

Metropolitan Toronto Council has voted to install a $12.2 million, rubber-tired electric train system within the 700-acre Metro zoo site in eastern Scarborough.

Council accepted the recommendation of the Metro Zoological Society that the electrically-propelled transportation system be purchased outright by Metro. It is hoped the three-mile system will produce an annual net profit of more than $1 million in each of the first 20 years of operation.

The trains, each holding 40 passengers and heated in winter and air-conditioned in summer, will operate along an eight-foot-wide concrete guideway, partly at ground level and partly elevated.

Trains will travel at five miles an hour, running past enclosures and through the 250-acre Canadian animal domain in the Rouge Valley where native animals such as bears, wolves and caribou will run with a great degree of freedom.

The zoo transportation system will not be installed by the time the zoo opens in July, but should be completed by the winter.

E. A. Washburn

Burlington PUC's general manager, E.A. Washburn, has died at the age of 57. Mr. Washburn, president of the Association of Municipal Electrical Utilities in 1956, took over the manager's position at Burlington in 1958, the first year the utility operated as a combined utility after the annexation of Nelson and part of East Flamboro townships.

At that time, the utility's service area was enlarged from approximately one square mile to 55 square miles. Burlington, which achieved city status on January 1, has a population of about 100,000.

A graduate in electrical engineering from Queen's University, Mr. Washburn served overseas with the Royal Canadian Navy in the Second World War, obtaining the rank of lieutenant.

He began his utility career as a junior engineer at Ontario Hydro and was appointed manager of Ingersoll PUC in 1947. From there he went to Stratford PUC where he served as manager until his appointment in Burlington.

A talented musician, Mr. Washburn ran the band at Queen's when he was a student and since then has had a band that played at various clubs in the Windsor-Detroit area. He is survived by his wife, Edith, a son, William, and a daughter, Susan. Both son and daughter are graduate electrical engineers.

Reassuring

It was reassuring to be participating in the official opening of a facility engaged in the production of energy rather than its consumption, Premier William Davis told guests at the official opening of the Nanticoke generating station.

Situated on the shoreline of Lake Erie eight miles east of Port Dover, the $755 million, 4,000-mW station will be North America's largest thermal-electric generating station upon completion in 1977. Nanticoke's total output will be more than sufficient to meet the electrical needs of



Premier Davis

the cities of Toronto and Hamilton.

"It should be a source of great pride," Mr. Davis said, "to Ontario Hydro and the people of Ontario that this province is leading the continent in the generation of electric power.

"Hydro's example of leadership in this regard cannot be over-emphasized, though it is too often overlooked, or at least taken for granted—simply because our electrical power needs, certainly in the past two decades of steadily increasing demand, have always been met, and met at very reasonable cost."

He added: "Nor should the people of Ontario forget or overlook Hydro's pioneering record of innovation. A year ago, I participated in the opening ceremonies of Pickering generating station, the success of which has been hailed by the world community of scientists and engineers."

Mr. Davis said that Ontario's steadily increasing demands for electric energy will "undoubtedly call for the construction of further thermal-electric stations, both fossil-fuelled and nuclear."

"It will also call for trade-offs between Hydro and environmental groups, and I don't think that we should delude ourselves for a moment that our concern for cleaner air and cleaner water or uncluttered landscapes is without its price.

"All of you, I'm sure, are aware of the various points of view and cost estimates currently being advanced before the Solandt Commission concerning the 500-kV Nanticoke-to-Pickering power corridor. It is not for me to comment on those proceedings, except to say that it becomes apparent there is a tremendous price spread between the alternatives being examined. This has to be reflected in the cost of power at some point in time," Mr. Davis said.

Stelco expands

The Steel Company of Canada Ltd. will spend $490 million on the first phase of it $2 billion steel-making complex next to Nanticoke generating station.

Construction is slated to start early thi year on the initial phase that will raise Stelco's ingot-making capacity by 1.3 million tons in 1978. Stelco's current stee ingot capacity is about six million tons a year.

J.P. Gordon, Stelco president, says th even by international steel industry standards, the first phase of the Nanticoke development ranks among the world's important incoming sources of new steel production.

"There have been other much larger projects—the Japanese, for example, have brought in installations of five to six million tons—but Nanticoke ranks as on of the industry's major enterprises," Mr.

Gordon adds.

Employment during the construction period will gradually increase to about 3,000 by 1976. When production starts in 1978, it is expected that about 1,500 people, drawn as far as possible from local communities, will be employed at the complex.

Installations in the first phase will include: a semi-computerized, 80-inch continuous strip mill; a blast furnace and a two-furnace basic oxygen shop; a double-strand continuous casting machine for production of slabs and installation of a direct reduction kiln at Stelco's Griffith mine in Northwestern Ontario.

U.S. may choose Candu

The U.S. may be building Candu nuclear reactors based on Canadian technology within the next decade, says L.R. Haywood, head of the heavy water division at Atomic Energy of Canada Limited.

Such a switch in U.S. nuclear thinking would completely vindicate nuclear systems on which Canadian utilities are starting to rely heavily. And it would silence critics of the Candu system.

Reason for the switch if it comes, Mr. Haywood says, will be heavy demand on U.S. uranium reserves.

Candu, he points out, uses less uranium than reactor systems currently favored in the U.S.

American authorities are working on the development of fast-breeder reactors, which will use far less uranium than conventional reactors. "But they are having more trouble than they anticipated," Mr. Haywood says.

He adds: "There is even talk that fast-breeder reactors will not be ready until 1995, instead of the 1983 originally anticipated."

If U.S. utilities do opt for Candu, "they would have to come to Canada because they have no expertise in building them."

Mr. Haywood suggested that Candu is "comparatively inflation-proof."

"Taking the total unit energy cost of a Candu generating station in 1972 as equalling 100—including capital, operation and maintenance and fuel—that cost in 1987 would be 129. Over the same 15-year period—taking 1972 as equalling 100 in each case—the reading for a coal-fired station would be 173 and 139 for a light-water reactor such as the U.S. favors."

Spent fuel cask

The U.S. Atomic Energy Commission has licensed a new shipping cask capable of holding several assemblies of spent fuel from nuclear power stations.

The new cask, designated IF-300, is intended primarily for rail use and weighs about 140,000 pounds when fully loaded. Its holding platform, which is secured to the bed of the rail car and holds the cask in place during transit, weighs an additional 35,000 pounds.

The cask is the first to accommodate several spent fuel bundles from the new generation of light-water reactors. The new generating plants, generally those designed after 1969, use fuel assemblies which are longer and which remain in the reactor core for more time than earlier plants. The IF-300 is designed to contain seven pressurized-water or 18 boiling-water reactor fuel bundles. Its use can reduce the number of shipments required to move spent fuel from nuclear power stations to reprocessing plants.

The cask is shielded by a combination of stainless steel, depleted uranium and water. It is cooled by natural convection and has an auxiliary forced-air circulation system powered by two diesel blowers.

The design has undergone intensive evaluation and has been demonstrated to meet AEC regulations, which prescribe design standards. The regulations require that casks be able to withstand severe accidents, including impact, puncture, fire and flooding.

Inverhuron untouched

Ontario Hydro has purchased the 550-acre Inverhuron Provincial Park, south of the Bruce nuclear development, and leased it back to the Ministry of Natural Resources for 999 years at the rate of $1 a year. The lease, which only the ministry can break, guarantees that Hydro will not build on the park site or alter its wilderness characteristics in any way.

The government will establish an 1,800-acre park at MacGregor Point, 10 miles north of the Bruce site, with the money Hydro is paying for Inverhuron.

Overnight camping in Inverhuron park is being eliminated to meet Atomic Energy Control Board safety guidelines and ensure the continued operation of the Bruce heavy water plant. Instead, camping facilities will be provided at the MacGregor Point site.

The AECB had told Hydro it was concerned about the protection of overnight campers should hydrogen sulphide gas be accidently released from the heavy water plant.

Although such a risk is believed to be small, it was thought that restrictions on the use of Inverhuron were necessary as an extra safety measure.

The MacGregor Point park will open to the public in 1975. Overnight camping in Inverhuron will be permitted until October 31 this year. After this time, the Inverhuron beach and picnic areas will continue to be open during the daylight hours, subject to AECB approval.

In a further step toward the expansion of the Bruce development, AECB is reviewing applications from Hydro for approval of two additional sites. One application is for the location of four additional nuclear power units similar to the four 750-mW Candu units currently under construction. The second is for approval to locate two heavy water production units next to the existing heavy water plant.

Metermen meet

Close to 200 delegates from across the province attended the Association of Municipal Electrical Utilities meterman's workshop in Ottawa where subjects ranged from the legal aspects of cut-offs of electrical service to a light-hearted look at officiating in the Canadian Football League.

A major feature of the get-together was group discussions structured to permit active participation of all delegates.

Part of the educational program included presentations by Westinghouse Canada on single and elementary polyphase metering and by Canadian General Electric on the metering of polyphase systems.

A Department of Consumer and Corporate Affairs delegation reviewed government requirements for utility computerized meter and related records, proposed changes in regulations and other plans.

Among the group activities were workshops on basic metering, basic metering installation, an advanced metering workshop, an advanced metering installation seminar and a session on meter management and administration.

Among the keynote speakers were I.L. Bradley, of Waterloo, AMEU vice-president, and F.L.G. Askwith, general manager and chief engineer of Ottawa Hydro.

"Hap" Shouldice, director of officiating, CFL, took a light-hearted look at officiating in the league—a timely subject considering the host city's team walked off with the Grey Cup.

Port Moosonee

Moosonee, says James Jessiman, chairman of the Ontario Northland Transportation Commission, has potential for development as a barge port.

However, Mr. Jessiman ruled out the possibility of this largely Indian community at the southern end of James Bay ever becoming a great seaport.

He said this would entail constant dredging because there are sandbars 30 miles offshore.

Docking and barging facilities would not disturb Indians in the area and would not harm the ecology, Mr. Jessiman says.

Another development under consideration in the Moosonee area, he adds, is extension of Ontario Northland rail facilities another six miles to Sandspit Island, where there is a constant 13 feet of water.

municipal briefs

Oakville PUC has approved an experiment which could mean removal of the familiar electric meters from the outside of buildings. The go-ahead was given for installation of a remote-reading device in several homes. The device, slightly smaller than a brick, can be recessed into the exterior wall to relay readings from the meter inside the building. The experiment came as a result of one of the utility's customers suggesting that the outdoor meter "is ugly and does not fit in with planned renovations."

L.C. Simpson, a 15-year Ontario Hydro employee, has been named municipal accountant in Hydro's Eastern Region. He succeeds A.G. Hotchkiss. Mr. Simpson was formerly unit head—cost accounting in the Peterborough construction zone office.

Ontario Hydro's Niagara Region has a new consumer service superintendent, W.A. Thomas, formerly assistant area manager in New Liskeard. A graduate in electrical engineering, Mr. Thomas also worked in the consumer service department in Eastern Region.

More than 200 people attended the first night of Welland Hydro's open house and a similar number showed up the following two evenings to mark the utility's diamond jubilee. Featured among the displays were a slide show depicting the utility at work, history of light, an ultrasonic cleaner, various items of electronic equipment and a ham radio display.

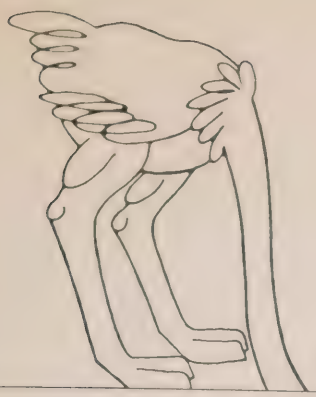
When Leamington PUC line foreman Bill Galloway closed a 600-ampere load-break switch recently, it marked a milestone in the utility's history. His action signified the utility's entry into the era of high-voltage distribution. A mall on Talbot Street was first to be supplied power at the 27,600 to 16,000-volt level.

London Public Library Board has sold three of five pieces of historical railway rolling stock it owns to an Orillia man to use as part of a restaurant. Car 4, a London and Port Stanley self-propelled electric passenger coach, a caboose and a former Dominion-Atlantic executive coach built in 1885 were sold. The electric passenger car, built in 1915, was one of a group of cars for a network of radial railways proposed by Sir Adam Beck.

A 13-week strike has been settled at Mississauga Hydro with a 10 per cent wage increase retroactive to August 1, 1973, and 7-1/2 per cent effective January 1. The new agreement excludes new employees from vesting sick leave credit.

East York Hydro's outside workers recently settled a 14-week strike and returned to work on a two-year contract calling for a 10 per cent retroactive wage increase to April 1, 1973, and 7-1/2 per cent on January 1. The 1974 lineman's rate has been set at $6.31 an hour.

Sudbury Hydro's marketing manager since 1967, D.W. (Don) Dowds, has been appointed the utility's assistant general manager and chief engineer. Before joining Sudbury Hydro, Mr. Dowds was employed by Ontario Hydro for 13 years



as don wright sees it

Funny how the old mind works. We were thinking the other day of an old tomcat we used to have called Sam and he put us a bit in mind of Hydro in the vicissitudes of the seventies. We bought Sam for a dime and a broken slingshot and as the advertising boys at Ford would say - he was a lot of cat for a little scratch.

A persistent old cuss, he has long since gone to his just reward, which could only be a world peopled entirely by lady pussycats. But he knew what he had to do and he spent most of his waking life in pursuit of his goal. He was a lover but also a fighter. Battered and bruised he would return to the fray night after night totally undeterred by the loss of half an ear and a goodly piece of his tail.

Diligent and task oriented to the end, he suffered the slings and arrows of outrageous fortune with nary a whimper or plaintive meow. Service was his thing, and as far as we know he kept his customers happy.

Get the parallel? Like we said, it's funny how some old mind works and we are not suggesting any similarity between the goals and objectives of Hydro and those of old Sam. But the lights still come on whenever we press the switch and that suggests a devotion to the primary task at hand which even Sam would have approved. And after a trip around the province via the press-clipping service we know how he must have felt in the course of a tour of nocturnal duty. Finding a bouquet among the brickbats is like looking for a four-leaf clover.

Biggest mass producer of brickbats seems to be the transmission line projects and no doubt this is understandable. At the same time, we can't help wondering whether or not these structures really live up to their reputation for sheer horror and unadulterated ugliness.

Driving through the countryside recently we chanced to pass the EHV line coming down from the north and having been "The Exorcist" we pulled to a stop prepared to disgorge the contents of our tummy at the hideous spectacle. Arching across some of the most beautiful country this side of paradise, as all transmission lines do, this particular V-towered structure left us in full control of the digestive process and we got back on the road with scarcely a burp.

We then took to examining the individual components of the landscape which together composed this particular piece of the Garden of Eden. Dead elms were by far the predominant feature. Standing like stark skeletons against the snow-covered countryside, they were there by the thousands - each a grim tribute to the deadly potency of a tiny beetle.

Picturesque rock-pile fences and stands of cedar vie with the beauty of steaming manure piles and broken down out-buildings as the scenery unfolded. And there were tattered old bill boards, gaping gravel pits and a hundred hulks of defunct automobiles.

All of which is to suggest that there is a helluva lot of homeliness in our landscape besides power lines. And since our real concern is the aesthetics of the overall environment, perhaps Hydro should take another tack and spend its anti-pollution dollars patching up eyesores. Tradeoffs between economic development and the environment must be accepted and for a mile of line Hydro could undertake to cut down a dozen dead trees, paint a dilapidated barn or two and shovel away a few tons of cow manure.

It's easy to be funny, of course, when the power lines are on somebody else's property, but be it known that we are not mere onlookers casting our snide remarks from the security of non-involvement. We have our cross to bear in the form of the biggest and fattest water tower ever contrived by the minds of men. And for more than 10 years we have lived directly in its shadow —— so close that if it were ever to spring a leak we'd all be flushed down the Don River and out to sea with all flags flying and the TV antenna at half mast.

And we bought the house in full knowledge that our nearest neighbor was 2,000,000 gallons of fresh drinking water. The trick is to weigh the advantages against the disadvantages all the time wearing a pair of rose-colored glasses. What are the advantages of living under a water tower?

One, of course, is the impossibility of becoming lost. We are among the few people who can spot their abode from the seat of a Boeing 747 at a height of 15,000 feet and 200 miles from town. Nor need we waste time drawing little maps for the benefit of out-of-town guests. Anyone dumb enough to miss our water tower isn't going to make a very stimulating visitor.

Pigeons are another plus mark. They love to live under water towers and this keeps them from roosting under our eaves. Except for the odd bit of half-hearted target practice, they leave us strictly alone.

And, man, do we have water pressure.

In all honesty, though, we cannot say that we love the thing. It doesn't have much of a personality and just stands there like a big fat dummy. Not a bad fault in suburbia these days, perhaps, and the fact is we're hardly even aware that it's there.

Except sometimes when the house is quiet and someone flushes the john. We hear the gurgling and gushing and good healthy chuckling from deep in the throat of our water closet and we think of it then. Man, do we have good water pressure.

Of course, our lights work well, too, and we can hardly remember the last time we had a power outage longer than a minute or two. In the steady glow of our lamps on a blustery winter night we sometimes think of the guy with one or two of those tall, dumb Hydro towers in his back forty and we are grateful. Fair exchange is no robbery and we hope our water tower is doing its stuff in his toilet.

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Hydro news

March/April, 1974

Government Publications

CH2ONEP
-H95



hydro news
march/april 1974

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Shortages of insulation are holding up completion of electrically-heated homes.

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Hydro's new warehouse system uses computer-guided vehicles and inventory control to produce efficiency and economies in handling goods.

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Sir Henry Pellatt, builder of Casa Loma, was connected with company that produced another architectural curiosity, the Toronto Power plant at Niagara Falls.

24 Ownership at issue

Questions of ownership, representation on the Hydro board, and restructuring of municipal utilities loomed large at OMEA-AMEU convention.

30 Along hydro lines

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Paul Page, Design Direction
Bill Flett, Design

the cover

Thousands of items from insulators to hard hats are stored at Hydro's new warehouse complex. Here, loaders equipped with flashing safety lights transfer items to the storage racks (see story on page 14).

Photo: H. Wilson

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hydro news, volume 61, number 2

Published by Ontario Hydro, 620 University Ave., Toronto.

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New Board takes office

Vice-Chairman, President chosen for Hydro Corporation

The six-man Ontario Hydro Commission has been replaced by a 13-member board of directors to coincide with the proclamation of legislation, March 4, turning the utility into a crown corporation.

With assets of $6 billion, Hydro will now be controlled by the new board, which will report to the Legislature through the Minister of Energy. Its members include an industrialist, a banker, a member of the Legislature, a university dean and several prominent executives and business leaders including two representatives from Ontario's municipal utilities.

By Royal proclamation, the 68-year-old Hydro-Electric Power Commission ceased to exist and its successor, the newly-created Ontario Hydro Corporation, came into being.

The new board consists of a chairman, a vice-chairman, and 11 directors, one of whom is the President of the Corporation.

Premier William Davis has announced that George Gathercole will remain chairman until the end of the year. He will be succeeded by Robert B. Taylor, vice-president of the Steel Company of Canada. Mr. Taylor will assume full-time duties as vice-chairman July 1.

Douglas J. Gordon, Hydro's general manager, was chosen president at the historic first meeting of the new Board on March 4. W.E. Raney, Toronto, is secretary of the Corporation.

In welcoming the new Board, Chairman Gathercole said "The diversified interests and viewpoints represented on the new board should serve Ontario Hydro well in meeting the challenges ahead."

Other directors are: Dean Muncaster, president of Canadian Tire Corporation and chairman of Task Force Hydro; Arthur Evans, MPP for Simcoe Centre and vice-chairman of the former commission; Andrew Frame, Burlington, a past president of the Ontario Municipal Electric Association (OMEA) and a member of Task Force Hydro; Douglas G. Hugill, Sault Ste. Marie, also an OMEA past president, a former officer of the Algoma Steel Corporation and present chairman of the Government Legislation Committee of the OMEA; Allen Thomas Lambert, Toronto, chairman of the board and chief executive officer of the Toronto-Dominion Bank; J. Conrad Lavigne, Timmins, president of Mid Canada Television System; Philip B. Lind, Toronto, secretary of Rogers Cable TV and chairman of the Sierra Club of Ontario; Mrs. Jean Pigott, Ottawa, president of Morrison-Lamothe Foods, and Dr. Robert J. Uffen, Kingston, dean of applied science at Queen's University.

At press time, a 13th director had yet to be appointed.

"To appreciate fully the scope of Ontario Hydro requires an awareness of the entire sweep of its 67-year history," said Premier Davis in announcing the new board. "Its co-operative but arms-length relationship with the provincial government and its partnership with the municipal electrical utilities have been two outstanding features.

"Moreover, while the Lieutenant-Governor-in-Council has appointed the commissioners of the Ontario Hydro-Electric Power Commission and by law has been required to approve certain activities before that body could undertake them, Hydro has nonetheless acted as an independent agency.

"Now new circumstances call for a change," Mr. Davis said. "As Task Force Hydro has observed, any economic enterprise of this size, and with such a rate of expansion, cannot fail to have a far-reaching and growing impact on the province. Mainly for this reason, the task force recommended that Hydro continue to be responsible for the generation, transmission and distribution of electric energy in Ontario, but that it discharge its responsibilities within the overall policy of the provincial government."

Mr. Davis noted that Hydro is responsible to the Legislature through the Minister of Energy. "The crown corporation framework provides the organizational distinctness and clear separation of policy and delivery recommended by Task Force Hydro. It further combines the principles of public accountability with the liveliness, initiative and considerable degree of freedom essential to the operation of a fast-moving and progressive business enterprise," the Premier said.

"The corporate form not only encourages delegation of day-to-day administrative activity within government policy guidelines, but also—more symbolically, perhaps—signals a break with the past."

The Premier paid tribute to three former commissioners, Roger N. Seguin and Louis Danis, whose terms expired December 31, 1973, and Dr. J. Douglas Fleming, who since 1969 has been one of the OMEA representatives on the Commission.

George Gathercole

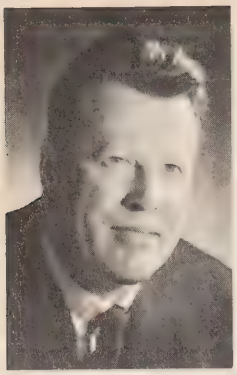
In his younger years, Mr. Gathercole was a professional sportsman. He's been carrying the ball as Hydro chairman since 1966 and before that was vice-chairman for five years. His initial career at Hydro as an economic executive assistant was interrupted by the Second World War in which he served in the Royal Canadian Navy.

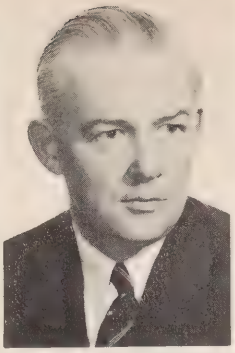
Mr. Gathercole was born in Hamilton and began work at the age of 18. He attended night school to gain university entrance and subsequently graduated from McMaster. At one time, he played football for the old Hamilton Tigers and financed post-graduate studies at the London School of Economics in England by playing professional hockey and baseball.

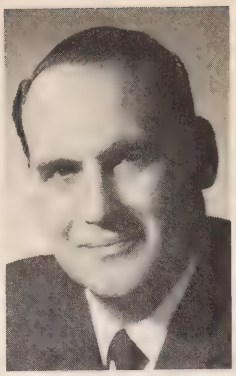
He has an MA in economics from the University of Toronto and Doctorate of Laws degrees from both York and McMaster.

Mr. Gathercole's Ontario government career began in 1945 when he was appointed its first practising economist. He was later chief economic advisor holding the positions of provincial economist, assistant controller finance, Deputy Minister of Economics and Deputy Minister of Economics and Development.

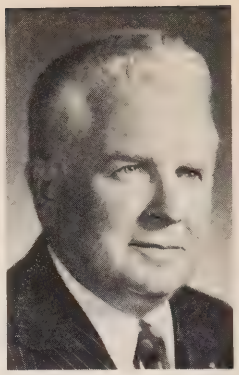
Mr. Gathercole is a director of Atomic Energy of Canada Limited, the Canadian Nuclear Association, and the Toronto Orthopaedic and Arthritic Hospital, member of the senate of the Stratford Shakespearean Festival Foundation, and member of McMaster University board of governors.

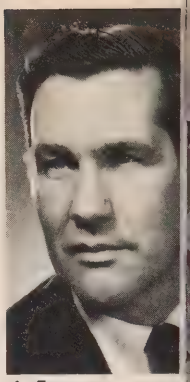

G. Gathercole


R. B. Taylor


D. Gordon


J. D. Muncaster


D. A. Evans


A. Frame

Robert Berkeley Taylor

Mr. Taylor has been vice-president and treasurer of the Steel Company of Canada since 1959, and has been employed by the company since 1949. Prior to that he was on the faculty of the School of Business Administration at the University of Western Ontario.

Mr. Taylor was born in St. Thomas and received his primary education there. He is a graduate of the University of Western Ontario and a Fellow of the Institute of Chartered Accountants of Ontario.

During the Second World War, he served with the Royal Canadian Navy in the North Atlantic.

He is at present a member of the Canadian board of directors of the Standard Life Assurance Company and of the Toronto Advisory Board of the Royal Trust Company. Mr. Taylor is a member and past chairman of the board of governors of McMaster University, and a member of the Advisory Committee to the School of Business Administration at the University of Western Ontario. He is a member of the Ontario Economic Council, and served as a member of the steering committee on Task Force Hydro.

Douglas J. Gordon

The new president, Douglas J. Gordon, joined Ontario Hydro's municipal department in 1945 after graduating in electrical engineering at Queen's University, and service with the Royal Canadian Navy. In 1948, he was named consumer service superintendent of Toronto (now Central) Region. Three years later, he returned to Head Office as assistant municipal service engineer and in 1953 became municipal service engineer.

In 1958, Mr. Gordon was named manager of consumer service and the following year became director of consumer service. He subsequently was appointed executive director—marketing, assistant general manager and deputy general manager.

Mr. Gordon is a member of the Association of Professional Engineers of Ontario, the Toronto Electric Club and the Toronto Board of Trade. He's a past president of the Canadian Electrical Association and served on the steering committee of Task Force Hydro.

J. Dean Muncaster

Mr. Muncaster was born in Sudbury 40 years ago. He graduated from the University of Western Ontario with an honors BA and a degree in Business Administration in 1956 and received his MBA from Northwestern University in Chicago the following year.

He joined the Canadian Tire Corporation as a financial analyst in 1957, became a retail store manager in Sudbury three years later, vice-president in 1963 and in 1966, at the age of 32, was elevated to the presidency.

Mr. Muncaster is a director and member of the executive committee of the Retail Council of Canada, and is associated with the Young Presidents' Organization of Toronto, and the National Design Council. He is a director of the Metropolitan Toronto Zoological Society and was chairman of the steering committee of Task Force Hydro.

Mr. Muncaster was a member of the former Ontario Hydro Commission. He is also vice-president and director of Canadian Tire Acceptance, a director of National Trust Company, Canadian Pacific Hotels, Black and Decker Manufacturing Company (U.S.), and a number of private companies.

D. Arthur Evans, MPP

Mr. Evans, who has been vice-chairman of the former Hydro Commission for nearly three years, was born in Beeton, Ontario. He now lives in Bradford where he served as reeve for 10 years and became the town's first mayor in 1960. A few months later, he resigned from the post on his election to the Ontario Legislature.

During his career in municipal government, Mr. Evans became active in the Hydro organization through Bradford PUC, of which he was a member for 14 years, and the Ontario Municipal Electric Association. He served as a director of OMEA District 2 from 1958 to 1960.

Mr. Evans' career also includes service as a member of the district high school board, member of Simcoe County Council and Warden of Simcoe County in 1958. He's currently a director of the Municipa Savings and Loan Corporation in Barrie

Andrew Frame

No newcomer to Hydro, Mr. Frame was member of the five-man steering commi tee of Task Force Hydro and was presid of the OMEA in 1971.

He was born in Toronto and receivec his B. Sc. in electrical engineering from University of Toronto in 1951. For the n six years, he studied at nights and week ends and received a Masters degree in business administration in 1957.

Mr. Frame's close association with t Hydro organization began in 1953 wher became district sales engineer for Engl Electric of Canada and dealt with muni pal utilities in the Niagara district in connection with transformers and subs tion equipment.

Parallel with his career at the manuf turing level, Mr. Frame began to demor strate his involvement with the commur at home in Burlington. He was elected the local public utilities commission in 1957 and is its present chairman.

He was a director of District 5, OME for three years before becoming distric president in 1969. He became provinci president two years later.

Douglas G. Hugill

At 56, Mr. Hugill has a varied backgrou including 17 years in public life as a member of Sault Ste. Marie PUC.

By profession he is an accountant a for 37 years was employed by the Algo Steel Corporation, retiring last Decemt devote full time to a tax consulting bus

Mr. Hugill was born and educated ir Sault Ste. Marie. He takes pride in his Scottish ancestry and in Sault Ste. Mar which, he says, is "one of the best-ligh cities in Ontario."

He served on the community's first elected commission in 1957 and has b active in the Hydro family ever since. H spent three years as chairman of the lc commission and in 1966 was elected fi vice-president of District 9, OMEA. He moved up through the ranks to district president, a director of the provincial a


Hugill


A. Lambert


J. C. Lavigne


P. Lind


J. Pigott


R. Uffen

ciation and first vice-president of the provincial body in 1969.

He became president in 1970 and at that time indicated concern over regional government, environmental problems and inflation—all of which are still very much in the forefront of Hydro's activities.

Allen Thomas Lambert

Allen Thomas Lambert was born in 1911 in Regina, Saskatchewan. He moved to Victoria, B.C., at an early age and received both his public and high school education there.

Mr. Lambert joined the Toronto-Dominion Bank at Victoria in 1927 and subsequently served in Vancouver, Brockville and Montreal. His first managerial post was at Yellowknife in 1946. Ten years later he was general manager, a vice-president and director of the bank. He became president in 1960, chairman of the board in 1961 and chairman and chief executive officer in 1972.

He served as a navy lieutenant during the Second World War.

Mr. Lambert still has time for curling, fishing and golf apart from his varied business activities. He's a director of a number of corporations including IBM Canada; Westinghouse Canada; Hiram Walker-Gooderham and Worts; Hudson Bay Mining and Smelting Co.; International Nickel Co. of Canada; Union Carbide Corp. and Union Carbide Canada; London Life; Midland and International Banks; Canadian International Paper Co.; Dominion Insurance Corporation; International Consolidated Investments, Hong Kong; Adela Investment Co., S.A.; Arbuthnot Latham Holdings, London, England; Edmonton Centre; the Continental Corporation and Dome Mines.

He's a governor of York University.

J. Conrad Lavigne

Born in Quebec, Mr. Lavigne attended primary and secondary schools at Cochrane and then began his working career as a grocery store clerk, delivery boy and butcher. He is now president of one of the world's largest privately-owned television systems, the Mid Canada Television System, with stations in Sudbury, North Bay, Elliot Lake and Timmins, where he now resides.

Mr. Lavigne established himself in Timmins in 1936 and built and opened a grocery and butcher store.

From 1942 to 1946 he served in the Canadian Army overseas and was discharged with the rank of captain. In 1972, he was made honorary Colonel of the Irish Regiment, Second Battalion, in Sudbury.

The father of seven children, Mr. Lavigne became involved in many business endeavors ranging from a hotel to a furniture store. In 1951, he established CFCL Radio in Timmins, the first French-language radio station in Ontario.

He first obtained a television licence in 1956. In 1970, he was granted permission by the CRTC to establish television stations in Sudbury, North Bay and Elliot Lake.

His other appointments include: vice-president of Hedman Asbestos Mines, Timmins; vice-president of Waferboard Corporation; governor of Laurentian University, Sudbury; and director of Northern Telephone.

Philip B. Lind

At 30, Mr. Lind is the youngest member of the Hydro corporation board. He was born in Toronto and is a graduate of the University of British Columbia (BA) and the University of Rochester (MA).

He is employed in the communications business as secretary of Rogers Telecommunications Limited and Rogers Cable TV Limited. He is also a director of the Canadian Cable Television Association.

An avid conservationist, Mr. Lind is chairman of the Sierra Club of Ontario. He's also a director of the Conservation Council of Ontario and a member of the Ontario Government's Task Force Onakawana, a group connected with energy development in Northern Ontario.

Mrs. Jean Pigott

Mrs. Pigott is president and chief executive officer of Morrison Lamothe Foods, of Ottawa. Her husband, Arthur C. Pigott, is vice-president and general manager of the firm's catering division.

The company was founded as a bakery in 1933 by Mrs. Pigott's father and uncle. The firm today employs 500 people. Products include fresh baking products, a catering division and a frozen food division, located in Toronto, which makes a wide variety of products for sale in Canada and abroad.

Mrs. Pigott attended Ottawa Ladies College, Albert College, Belleville, and travelled widely in the United States and Europe before her marriage.

Her community work includes chairmanship of the Ottawa Regional Hospital Planning Council, membership in the I.O.D.E., director of the Food Processors of Canada and the Bakery Council of Canada, and president of the Windsor Park Village, a company building limited-dividend homes and condominiums in Ottawa. She is also a member of the Ottawa-Carlton District Health Council.

Robert James Uffen

Dr. Uffen is dean of the faculty of Applied Science at Queen's University, Kingston. Prior to this, he was on the faculty of the University of Western Ontario where he held various positions between 1951 and 1960.

Dr. Uffen, who has published several articles on the interior of the earth, has a distinguished scientific background. It includes membership on the National Research Council from 1963 to 1966; membership of the Science Council of Canada from 1967 to 1971; chairman of the Defense Research Board from 1967 to 1969; chief science advisor of the Privy Council Science Secretariat from 1969 to 1971 and a member and councillor of the Canadian Association of Physicists from 1955 to 1957.

His association memberships include the Association of Professional Engineers of Ontario, the American Geophysicists Union, the Society of Exploration Geophysicists, the American Insititute of Mining and Metallurgy, the Club of Rome, Fellow of the Royal Society of Canada, 1964, and Fellow of the Geological Society of America in 1967.

Dr. Uffen was born in Toronto. He received his BA Sc. in 1949 from the University of Toronto and moved to Western where he obtained his MA the following year. He received his doctorate in 1952 and a research fellowship from UCLA the same year.

His principal recreation is painting.

SILVER LINING



IN THE ATTIC

But a shortage of insulation material casts a cloud over the need to conserve energy.

by Rae Hopkins

Thick black lettering on a sign at the main entrance to the Canadian Johns-Manville Company's head office in Port Credit recently asked visitors to use the rear door.

An addition to the building was held up by a shortage of insulation material — one of the company's chief products.

There is, indeed, a nation-wide shortage of insulation materials, despite seven-days-a-week, around-the-clock production by manufacturers.

Vance Seddon, Beaver Lumber's building products manager, says insulation material has been in short supply for three years. "There wasn't sufficient production in all Canada to meet demands last year — and the current building boom, especially in the residential sector, certainly hasn't helped the situation."

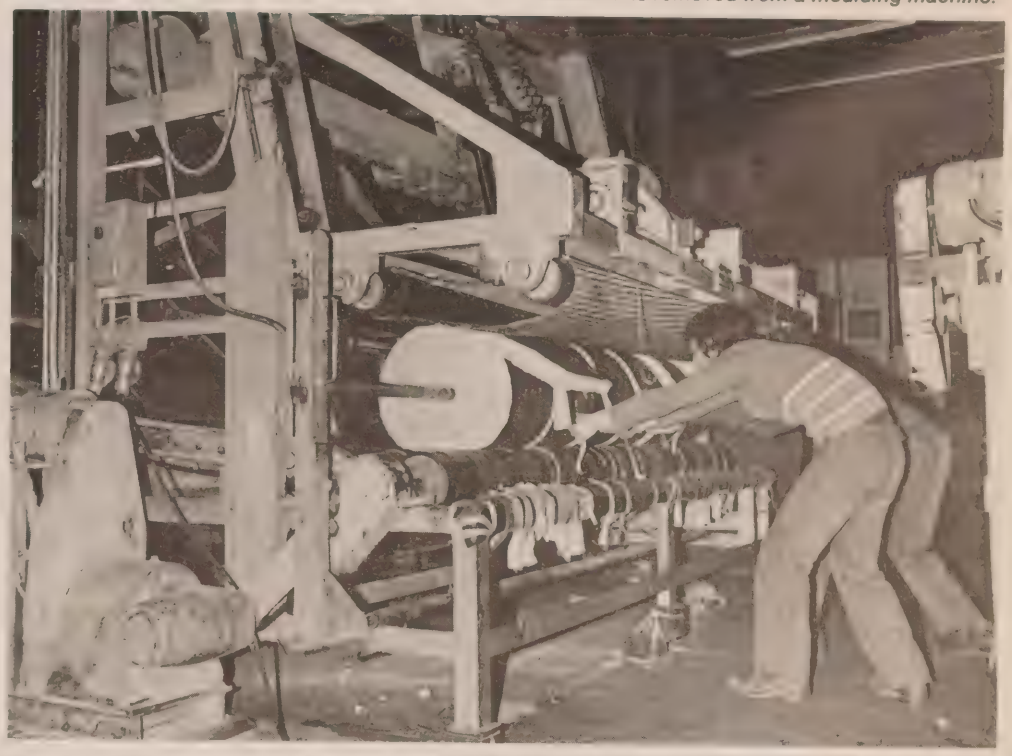
A load of insulation material lasts any of Beaver's 262 retail outlets across the country about two days. "Delivery is at least six to eight weeks behind," Mr. Seddon says, "and we cannot even begin to satisfy consumer demands, let alone the new construction market."

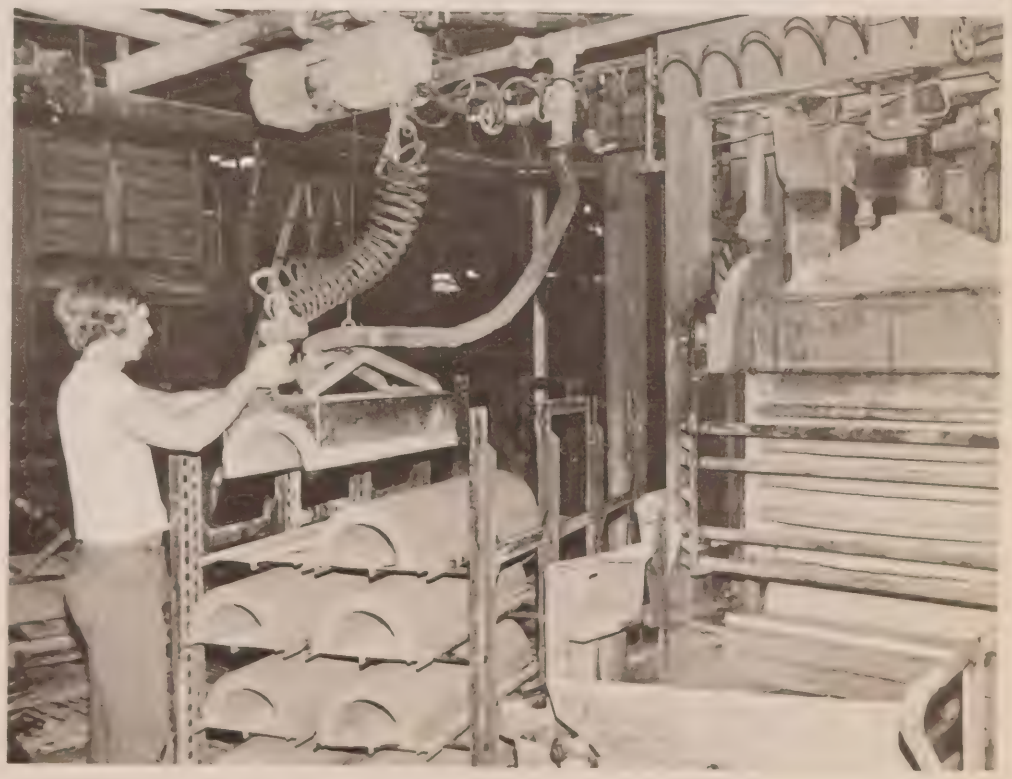
Despite the demand there's a growing consensus that insulation standards set out in the National Building Code are inadequate, especially in light of the energy crisis.

The Ontario Advisory Committee on Energy said in its report to the provincial government that it's possible to cut heat losses by up to 10 per cent in the average new home. "This would encompass a combination of savings from increased wall and ceiling insulation depths, installation of storm windows or triple panes, improved weather-stripping, caulking, and addition of storm doors to cut down the rate of infiltration of outside air.

"If it is to be assumed," the report added, "that higher construction standards were to be applied to new residential structures across the province to effect a 10 per cent saving in fuel costs, then the aggregate savings from 60,000 new units built annually would be about six trillion British thermal units per year, or about six billion cubic feet of gas or a million barrels of oil in 1980."

Household insulation batts, with vapor barriers attached, roll off the production line at the Canadian Johns-Manville Company's Toronto plant. In the lower photo, high-temperature pipe insulation is removed from a moulding machine.





Looking for all the world like giant spaghetti, insulation material is trimmed before packing. Fibreglass starts out as marble-like pellets which are melted down and turned into filaments.

And Ontario's Energy Minister, W. Darcy McKeough, in a 63-page report to Premier William Davis on energy policy last June, said: "It is notorious that there are inefficiencies in the heating of homes. Inadequate insulation and sealing of homes can result in a significant loss of energy."

Mr. McKeough called on the provincial secretary for resources development to "encourage improved insulation of homes and co-operate fully with the division of building research of the National Research Council and other agencies in the development of improved insulation materials and procedures.

"The Ministry of Government Services should establish higher insulation standards in buildings constructed for the province and define standards for promulgation by the Management Board for other projects where public funds are employed," Mr. McKeough told the Legislature.

Since then, F.A. Burr, NDP Sandwich-Riverside, has urged the establishment of minimum insulation regulations similar to those introduced in California earlier this year.

Speaking to the Legislature, Mr. Burr suggested an educational program to appeal to citizens to lower their thermostats and try to adjust to a slightly lower temperature in winter. "Likewise, in summer, an appeal could be made to air-conditioner owners not to turn on their equipment until the temperature reaches two or three degrees above what they're normally accustomed to."

Others, too, are promoting improved minimum insulation standards as a partial solution to the energy problem. Murray Phillips, manager of the Canadian Electrical Association's energy and administrative services division, says that CEA has been promoting better insulation levels for years "and will continue to push for them in the future."

Donald G. Stephenson, chief of the National Research Council's building services section, was quoted recently as saying that most Canadian homeowners can beat rapidly increasing fuel prices and trim their heating bills through the use of additional insulation in their homes.

"Loss of heat through poor insulation, especially in ceilings, costs homeowners hundreds of dollars over the years," Mr. Stephenson said.

For an initial outlay of about $300, a homeowner could insulate his ceiling — where most of the heat is lost — with loose-fill insulation. "Assuming that fuel prices remain constant, the $300 investment can be recovered in six years," Mr. Stephenson said. "But with rapid price increases, the initial investment probably can be recovered in savings on fuel bills much sooner."

Exactly what is insulation, anyway? Any construction material may be considered to have thermal insulating qualities. However, the materials considered as thermal insulation are capable of greatly reducing the flow of heat by conduction.

By definition, thermal insulation is any material that has the properties and ability to resist or retard the flow of heat at a rate greater than one British Thermal Unit per hour per square foot for every one degree Fahrenheit of temperature difference. This is accomplished by the action of millions of tiny cells that trap air in the product.

Two things happen when insulation is added to a home. Firstly, and most important, the fuel consumption will be cut drastically, reducing the amount spent on heating or cooling. Secondly, the comfort level will be greatly increased.

The moment heat is generated it tries to escape into the colder outside air. It escapes through the ceiling, pushes through exposed walls and trickles through cracks and openings in windows and doors. The rate at which heat escapes depends, almost entirely, on the resistance it meets. Insulation forms a resistance barrier to trap the heat and keep it inside the home where it belongs.

Take, for example, a three-bedroom, frame bungalow with a 1,200-square-foot floor area. It takes more than twice as much energy to heat an uninsulated version of this hypothetical home than it would a properly insulated one.

One of the main reasons a poorly-insulated house feels uncomfortable is a condition called the "cold wall" effect. The inside of an uninsulated wall may be eight to 15 degrees colder than the same wall when insulated. A person sitting close to the colder, or uninsulated, wall will feel chilly since the body heat is flowing toward the cooler surface. In addition, the air next to the cool wall becomes more dense and sinks. This displaces warm floor air which, in turn, rises. This sinking and rising of cool-warm air creates uncomfortable drafts.

Four types of insulation materials are commonly used. They are batt or blanket, loose fill, rigid and reflective. Basic materials from which insulation is produced include fibrous or cellular mineral matter such as glass, asbestos, silica, rock slag and mica; fibrous or cellular organic matter including cane, cotton, animal hair, rubber, wood, wood bark, cellulose and cork; cellular organic plastics such as polystyrene or polyurethane and heat-reflecting materials.

A few years ago, it was generally thought that the thicker the insulation around a home, the better the insulation job. However, this vague rule-of-thumb measurement no longer holds true.

With the introduction of a CSA standard on mineral wool thermal building insulation in 1968, a more dependable measurement of insulation effectiveness was established — thermal resistance, or R-value. Thus, the important consideration in selecting insulation is no longer thickness, but the R-value. While one brand of insulation might be thicker or thinner than another, if the R-value is the same they should perform equally well.

In 1966, the Ontario Electrical League designed a set of insulation standards for Ontario homes. These standards are muc higher than those laid down in the National Building Code for residential construction, but were designed to provide the optimum in comfort, efficienc and economy.

However, over-insulating beyond the maximum standards set by the OEL for Medallion certification will only increase the cost of doing the insulation job without providing a great increase in





Do-it-yourselfers can easily apply batt-type insulation to wall studs. With the emphasis on energy conservation, many homeowners are putting in additional insulation...when they ca get it.

benefits. For example, six inches of insulation in the ceiling area should provide ideal conditions. Increasing the thickness to 12 inches will not double either the comfort factor or the economic gains in terms of heating costs.

While the OEL's Medallion certification requirements are desirable insulation levels for electric heating, there is a general feeling they should become a minimum requirement for residential construction in Canada, regardless of the fuel used.

In a brief prepared for the Associate Committee on the National Building Code, W.L. Scott, Ontario Hydro's technical services engineer, residential sales department, and former manager of the OEL, points out that with current emphasis on making the most efficient use of all energy resources in Canada, it seems logical that one of the most essential uses — home heating — should be considered.

According to the brief, insulation standards developed by the U.S. Federal Housing Administration for any type of fuel and by the Canadian Standards Association for electric heating are essentially the same. Calculations by Ontario Hydro's technical services section showed that heating bills for a typical bungalow upgraded to CSA planning guide recommendations can be reduced by more tha 37 per cent.

Mr. Scott requested that the Associat Committee on the National Building Coc consider incorporating the CSA recommendations pertaining to thermal insula tion in all-electric homes as a minimum requirement for all residential construct in Canada.

Other countries have already accept these standards. In France, for example all new homes must be insulated to electric heating standards from 1975 or

some reflections on conservation

Ted Altpeter, Johns-Manville's product group manager for building materials and systems, says that unlike their U.S. counterparts, insulation manufacturers in Canada have no association to form an effective lobby to upgrade standards. However, Johns-Manville has held meetings with the National Research Council's building research division and Central Mortgage an Housing Corporation, both of which are studying the whole question of insulation in homes.

At the moment, minimum standards vary with the locality. The National Building Code divides the country into three zones, each requiring a different set of R- values.

Mr. Altpeter says that the main problem facing manufacturers is meeting the demand for insulation. Johns-Manville, for example, recently doubled its capacity to produce insulation in Canada.

"Some builders are now using increased insulation in homes as a selling point, regardless of the heat source they are installing," Mr. Altpeter says. But, he adds, it is impossible to put a percentage increase on the demand for insulating material because of the number of variables included, such as the exceptional construction year both in the residential and commercial sector, lack of production capacity, increased concern over the energy crisis and tighter building code restrictions.

Ontario's Minister of Government Services, James Snow, who is spearheading a campaign to conserve energy in the Queen's Park complex, says increased minimum insulation standards for the province have not been discussed yet, although he feels standards in Ontario are pretty high."

Mr. Snow, who was a builder before entering the political arena, has added insulation to his older home to help cut his heating costs.

And he says that if he were building himself a new home today he would put in the same level of insulation set out in the TEL Medallion certification standards — regardless of the type of fuel he selected.

"After all," he says, "insulation is the best investment a homeowner can make."



Model of Ontario Hydro's new head office illustrates mirror-like properties of the building's glass walls, which will provide summer comfort by reflecting solar heat.

Ontario Hydro's new head office in downtown Toronto has been designed with maximum insulation to cut heating and cooling costs and conserve energy.

Jim Patter, vice-president — engineering of Canada Square Corporation, developer of the new Hydro headquarters, says the building will also be equipped with an energy conservation tank for reclaiming heat.

Mr. Patter explains that heat generated from the lights during the daytime will be greater than what is required to warm the building, even in the coldest temperatures.

Under normal circumstances that heat would be wasted, but with the energy storage tank, water will be warmed during peak lighting periods and circulated throughout the building for heating during off-peak periods.

Mr. Patter points out that in a building of the size of Hydro's new head office, cooling is required year-round. Heat is only required in the periphery.

That's why, from the outside, the building will mirror the community — the double-glazed reflective glass walls being, in fact, a form of insulation to deflect the sun's heat. From the inside, Mr. Patter says, the effect will be similar to looking through sunglasses. □

INSULATION SCARCITY HITS ALL-ELECTRIC HOMES

Many new electrically-heated homes in the province are failing to qualify for Medallion all-electric status because of a lack of 3 1/2-inch, R-12 batt-type insulation.

Ontario Electrical League standards call for installation of the R-12 material in walls and six inches of R-20 in ceilings to qualify for Medallion certification.

However, builders are being forced to settle for thermal insulating material with a resistance value of 10 in order to complete homes for their buyers. While R-10 material meets National Building Code requirements and most municipal building code standards, it will not qualify for Medallion certification.

Bob Abraham, a sales assistant in Ontario Hydro's Georgian Bay region, says homes are not being held up because of the shortage of R-12 insulation, but certification is.

"Some homebuilders are putting in rigid insulation, or whatever they can get, just to get the houses complete," he adds. "Rigid insulation is much more expensive than batt-type material, but builders are being forced to use it."

Mr. Abraham says he did a survey of suppliers in the region to determine the availability of R-12 and has learned there is some available.

"There appears to be a communications problem between the manufacturers and the local supply houses," he says. He points out that manufacturers claim 3 1/2-inch batts are available, but that dealers must specify that's what they want.

"There are two types of R-12 batts, the 3 1/2-inch friction-fit batt designed for wall installation and 4-inch batts with a vapor barrier for ceiling use. No way will the 4-inch batts fit in the wall studs, which are classified as 2 x 4 lumber but, in fact, measure only about 3 5/8 inches."

In the Niagara region, Harold Barclay, a sales services supervisor, says all-electric homes were being held up because of the shortage of R-12 insulating material but builders are now starting to acquire some. Where they've been forced to settle for R-10 batts, certification is being withheld.

Mr. Barclay says manufacturers are having difficulty getting tooled up to produce 3 1/2-inch, R-12 batts. "It's only needed for all-electric homes, therefore manufacturers are reluctant to produce it for they can't be sure of the market and suppliers don't want to stock it for the same reason."

But as a result of the energy crisis, he points out, it is hoped the federal government will adopt R-12 insulation as a minimum standard regardless of the type of fuel used for heating.

In Western region, consumer service supervisor Marsh Hagelstein says sales personnel get "real conflicting reports."

A check with suppliers, he says, suggests that R-12 batts can be obtained but they do not stock it. Builders say they can't get it. Here, again, certification will not be granted with the use of R-10 insulation which builders are being forced to install.

And in the Northwest, there appears to be no shortage of insulation material in the Thunder Bay area. However, Public Relations Officer Don Carmichael says "only the odd home is being built here with electric heating." Mr. Carmichael attributes the few housing starts to "economic slack" in the region.

In Hydro's Central region, which includes Metropolitan Toronto, there was a problem getting material a short time ago, however R-12 batt-type insulation is beginning to appear on the market.

Bill Broad, an Eastern region sales supervisor, says the problem there is common to many parts of the province — a shortage of R-12, 3 1/2-inch batts. "When it is available, it's all pre-sold, therefore builders cannot get it," Mr. Broad says.

In this area of the province, where the only really large centre is Ottawa, material shortages are not peculiar just to insulation. "There's a shortage of tar and felt papers used as vapor barriers and the price is astronomical. It's up at least 60 per cent in the last year," says Mr. Broad.

And in Northeastern region, Bill Ogel, a Hydro employee who doubles as secretary of the North Bay Housebuilders Association, says deliveries of just about all building materials are behind.

"You just can't get R-12 insulation in 3 1/2-inch batts, but there is some loose-fill material available. In fact, all building materials are in short supply in the north and it's almost impossible to get electric baseboard heaters as well," Mr. Ogel says.

Ted Altpeter, Canadian Johns-Manville Company Limited's product group manager for building materials and systems, says that until last year manufacturers only produced 3 1/2-inch, R-12 fibreglass insulation batts as an order item. But it is now a product line and has been added to inventories.

Mr. Altpeter says the R-12 insulation requires more glass and "while capacity was tight we wanted to get the best use out of our facilities. That means producing more of the R-10 material."



UTILITIES FEEL THE PINCH AS WOOD SUPPLY DWINDLES

Yet another aspect of the present scarcity of world commodities is a shortage of the familiar wood poles used by electric and telephone utilities. It's a shortage which could reach crisis proportions.

Wood poles are used extensively in the transmission of electricity up to 115,000 volts while almost all overhead distribution lines are also carried on wood poles.

"Municipal utilities, especially the smaller ones, are being extremely hard hit," says W.A. Lawson, Strathroy PUC manager, who recently went with a delegation from the Association of Municipal Electrical Utilities to the Department of Industry, Trade and Commerce to seek help on the problem.

According to government officials, says Mr. Lawson, logging companies in B.C. are short of labor to go into the northern bush to cut the poles. Timber-cutting restrictions in Algonquin Park have compounded Ontario's problem.

"Small utilities are behind the eight ball as far as getting poles is concerned," Mr. Lawson adds. "Suppliers will not even accept orders for cedar poles because they cannot guarantee delivery."

Mr. Lawson last ordered a truckload of poles in April, 1973. He received delivery in late August. "So bad is the situation that the last time I tried to order poles the supplier told me he couldn't get pine and I'd have to settle for spruce. Admittedly, they're a nice-looking pole, but we've had no experience climbing them."

The manager of another small utility ordered cedar poles only to be told that the supplier could guarantee neither the delivery date nor the price. In 1970, utilities were paying around $64 for 40-foot treated cedar poles. Last June, if they were able to get them, the cost had skyrocketed to $148.

Not only the smaller utilities are feeling the pinch. Jack Cooke, of Ontario Hydro's supply division, says Hydro's suppliers fell 25 per cent short of their commitments last year.

"It is now apparent that the severe shortage of wood poles that we began to experience in early 1973 will continue through 1974 and extend well into 1975. Throughout all this, prices have continued to rise," says Mr. Cooke.

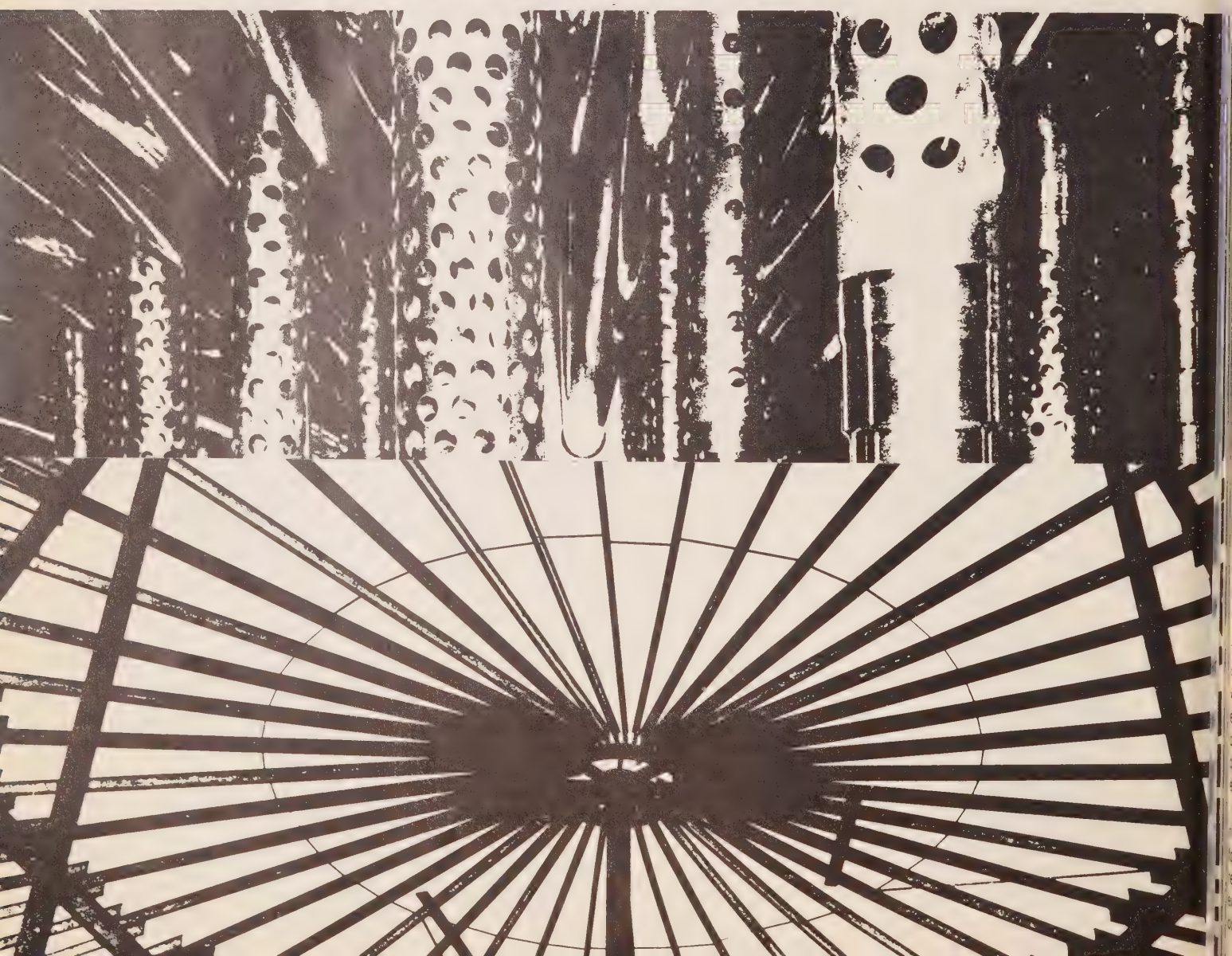
He attributes the shortage to reallocation of timber rights, labor problems, demand for other forest products and unusually high demands by other utilities. To ease the situation, Hydro has been forced to switch from cedar, jack and red pine in some sizes to other types of pole including southern yellow pine, lodgepole pine and fir.

"Delivery of these new poles will not begin until May and the result will be that in this abnormal situation our inventory will dwindle and reach the lowest point I can remember this spring," adds Mr. Cooke.

Some experts predict the wood-pole shortage will force municipal utilities to shift to concrete or steel poles. But this would be a difficult move for smaller utilities which cannot afford expensive bucket-truck equipment and still rely on linemen wearing the traditional climbing spurs.

"Even if we did switch to steel poles," Mr. Lawson says, "where are we going to get the steel?" □

GIVE PRIVATE FIRMS



MORE HYDRO WORK

...Task force report

Increased use by Ontario Hydro of the services of private companies and less reliance on internal resources is urged in the fifth and final report of the Task Force Hydro study.

Entitled "A Policy for Make or Buy," the report concentrates chiefly on the design and construction, computer and maintenance functions of the Ontario Hydro organization.

Among its specific recommendations is one that Hydro increasingly contract out design and construction services for certain transmission lines and transformer and distribution stations within five years, and transfer to the private sector the design and construction of selected nuclear or fossil-fuelled generating stations within 10 to 15 years.

"In general, we seek to encourage Hydro to adopt the 'buy' alternative to a greater degree than in the past with a view to transferring Hydro technology to the private sector and enhancing Hydro's internal cost-effectiveness," the task force says.

"The achievement of this goal will not be easy, nor can it be accomplished immediately in some cases. There will be a need to develop resources external to Hydro before 'buy' decisions become practical in many areas. In addition, Hydro will have to continue to 'make' for reasons of reliability or system security, in such areas as system planning, project management and conceptual engineering."

The report says that in building up one of the largest electric utility systems in North America, Hydro has acquired a wealth of technical and managerial expertise. Were Hydro to place more emphasis on contracted services, the private sector would benefit from this accumulated expertise. In addition, there would be benefits for Hydro as it worked more closely with those in a competitive environment.

"As a prime example, Hydro's engineering and construction skills utilized in fossil-fired or nuclear generation projects represent a potential which could be exploited by the private sector in export or domestic markets," says the report.

"There are precedents which confirm the practicality of such a process, for it was technical expertise originating in Ontario Hydro upon which one of Canada's largest engineering companies gained a world-wide reputation in the hydro-electric field.

"The time now seems ripe for Hydro to assist Canadian engineering and construction firms to build a similar reputation in the fossil-fired and nuclear generation field. Similar opportunities may also exist for Hydro to extend assistance to those in the private sector working in computer technology."

The task force says that lack of expertise in the private sector poses severe problems in the development of a "make" or "buy" stance—problems which will require considerable effort to overcome.

Buying outside computer services, for example, has been hindered until recently by the small number of external data centres with the level of experience necessary to meet Hydro's processing needs. "Many of Hydro's current activities are on a very large scale, and involve a high level of technical and management sophistication."

Growing demands for electricity imply a significant growth in Hydro staff, says the study. If present "make or buy" policies were continued, Hydro engineering staff would increase by 28 per cent between 1972 and 1980 and construction staff would expand by 105 per cent.

The report suggests that by making greater use of outside resources to meet the growing workload, Hydro will be able to hold staff increases at a lower level than would otherwise be the case.

"It should be emphasized that we are not recommending reductions in the Hydro organization, despite our advocacy of higher levels of 'buy' in Hydro's future. What we do suggest is slower, more closely-controlled growth rates and more efficient, more effective utilization of Hydro manpower in order to provide the degree of flexibility necessary for Hydro managers to make 'buy' decisions whenever these appear desirable."

The task force recommends that Hydro use to the fullest possible extent system growth and normal attrition to offset reduced staff requirements in those areas affected by contracted services. It also suggests that any employees displaced be transferred internally with retraining where necessary or, as a last resort, be provided with full assistance in relocation.

"With proper planning, there is no reason why increased levels of 'buy' cannot be phased so that the effects on staff requirements are offset through normal attrition and system growth," says the report.

"Nevertheless, occasionally, an internal program may have to be cut back because users opt to 'buy.' In such cases, Hydro must be prepared to transfer people and, where internal relocation is not feasible, to arrange transfers to other organizations on a temporary or permanent basis.

"Before release is resorted to, there should be a Hydro-wide search for a new position which could be filled by the individual with retraining. When, in the final analysis, release is inevitable, equitable severance benefits must be provided and full assistance for relocation."

The report stresses that Hydro must be able to compare its costs with those in the private sector if it is to weigh the advantages of "make" or "buy."

"To ensure that Hydro users have access to a market composed of internal and external resources competing on a comparable footing, internal service groups must base their charges on the full cost of providing service, including personnel and equipment costs, overhead, rent, depreciation, fringe benefits and the like."

The study suggests that Hydro should adopt a more open information policy for all forms of tendering, especially when competitive bids for goods and services have been received in response to public advertisements. It also recommends that the provincial government confer with other provinces and federal officials to seek elimination of interprovincial trade restrictions. □

ROBOT CARTS SPEED HYDRO GOODS

New warehouse features computerized control.

by Bill Settatree

Picture yourself on a grocery-shopping expedition. You enter the supermarket with your grocery list, climb aboard an oversize shopping cart, insert the list in a special cassette...and the cart automatically takes you to the spot where the first item is stored and so on down the line until the list is complete.

Sounds a little far-fetched, doesn't it? But such a system already exists for the "shoppers" at Ontario Hydro's new $3.25 million warehouse in Etobicoke where a highly-sophisticated computerized system is speeding the delivery of thousands of items of merchandise throughout the province.

Be it a barrel of soap for building maintenance or a box of nuts and bolts for a generating station, the picking machines — each of which is worth $70,000 — will follow instructions from computer cards, take the picker to the exact spot in the warehouse where an item is stored, elevate him to the shelf and do everything but reach out and count the quantity he requires.

Essentially battery-driven fork-lift vehicles, the picking machines are guided by impulses from wires embedded in the warehouse floor. In fact, more than five miles of wire is buried along the aisles.

"We used special saws to cut the floor and install the wire after the warehouse was built," says Bob Mills, who developed the computer program for the system. The saw cuts have since been filled in leaving just a faint line in the floor. At corners and intersections, grid patterns in the floor identify aisle numbers and speed codes. As the "shopping carts" travel over the grids, their logic systems match the grid aisle number with the number on the cards. If the two match, the vehicle decelerates and turns down the aisle.

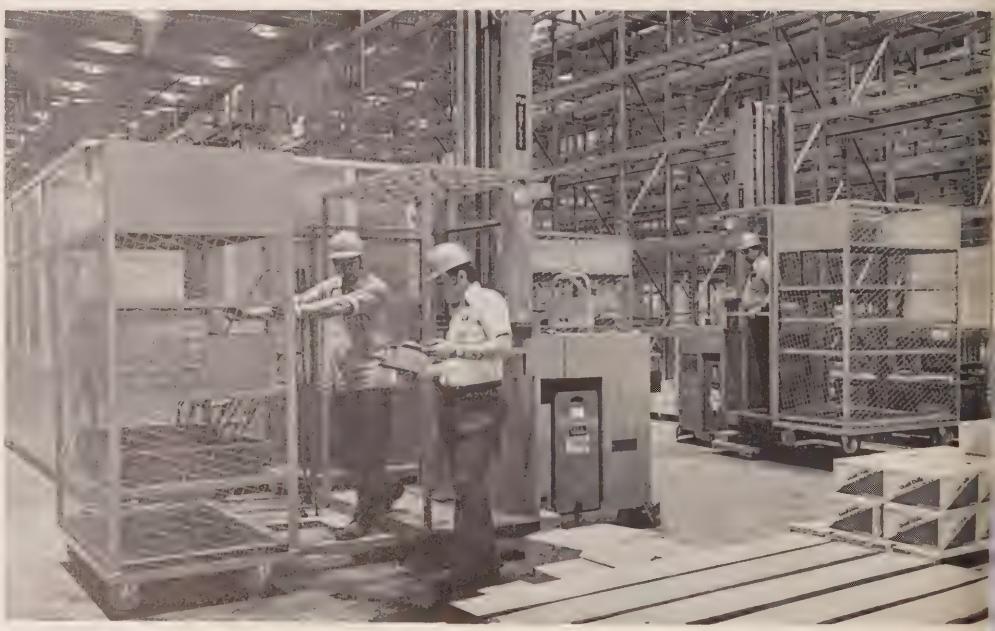
Mr. Mills spent more than a year on the computer program, which was adapted to existing warehouse codes to keep changes to a minimum.

A computer in downtown Toronto takes orders from terminals at Hydro locations anywhere in Ontario. At present, these are held and processed once a day, but eventually it is hoped to add an on-line



New warehouse will be able to handle Hydro's central stores requirements until 1980. Other photos show $70,000 picking machines and the equipment which enables them to receive electronic commands from grid of wires embedded in the floor.







computer at the warehouse to speed up the operation even further.

The vehicles carry goods in a removable storage module composed of numbered tubs or baskets — one for each order. Each of the four picker units has five modules. When a module is fully loaded, the operator takes it back to a dispatch area for shipping.

Each tour of the vehicle is programmed to end when either the maximum cube or maximum weight limit of its storage module is reached. The limits are 80 cubic feet or 1,400 pounds. Punched cards are also provided to return the picker to home base at the end of a run.

Only two other Canadian warehousing operations have a similar system. These are at Chrysler Corporation and Home Hardware. The Hydro system, being the newest, has more up-to-date features.

The new warehouse replaces one central building, several temporary structures and some rented space formerly occupied by central stores personnel.

Gord Taylor, manager of service centre facilities, says savings will be realized in search and picking time, but the biggest economies will result from having all merchandise under one roof.

Time is important in a warehouse that has 100 trucks coming and going every day. At present, there are more than 11,000 standard items in stock and this number is increasing by about 1,000 a year. More than $8 million worth of stock is on hand at any one time. The average amount shipped is around 3.5 million pounds a month.

About $25 million worth of merchandise passes through the warehouse each year. This volume will more than triple by 1980, by which time additional warehouse space may be required.

Mr. Taylor expects that the warehouse will go on a two and possibly three-shift operation to expedite overnight delivery when a new program known as IM3 goes into effect this spring. Under the program, up to 76 locations will eventually be guaranteed next-day delivery.

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Mr. Percy's pedal pushing pays off



He covers up to 15 miles a day around new warehouse.

Take a new, multi-million dollar warehouse with sophisticated materials-handling equipment, add one man and a bicycle and what have you got? The answer: Frank Percy, warehouse foreman, on his daily rounds.

For five years now, Frank has been cycling up to 15 miles a day at Ontario Hydro's warehouse complex.

"I have to look after the outside as well as the inside and the bicycle seemed to be the most efficient way to do it," he says.

With a warehouse complex the size of Hydro's, it would take a good part of Mr. Percy's day to walk from one area to another.

There would be a lot of time wasted getting from place to place, so Mr. Percy decided on the next best thing—a bicycle. "I can get to some places in 30 or 40 seconds by bike that would take several minutes otherwise," he says. Mr. Percy is still using his cycle at the new warehouse and has plenty of room there with three of the 28 acres under one roof.

In fact, his idea has caught on. Security officers also use bicycles on their patrols.

Is Mr. Percy tired after a day at the office? Not a bit. He has a bicycle at home, too, and spends a good part of his spare time cycling. □

Operator inserts a computer card into his picking machine. The machine automatically takes him to the spot where the next item on his "shopping list" is stored.

continued from page sixteen

"If orders are placed by 4.30 in the afternoon, we'll be able to deliver the next day," he says. About half the system will be tied in this year and the balance in 1975. The move will enable Hydro to reduce inventories in remote locations.

Planning of the new warehouse started in 1968 when an operations research group under Dr. Bill Shelson was engaged to conduct a thorough study of the warehousing program. They described existing warehouse facilities as inadequate with poor communications links and obsolete materials-handling equipment.

"Furthermore, even with the maintenance of minimum economic inventory levels, the warehousing space available would soon run out," the study said.

Information gathered in the study was built into what the researchers dubbed "Oracle", a computer program to provide forecasts on materials demand in the years ahead.

It was on the basis of the operations research study that Hydro proceeded with the new warehouse. The entire complex covers 28 acres with the new warehouse occupying three. Previously, there were 16 buildings on the site, many of them unheated.

At the outset, Hydro engaged the warehousing consulting firm of Sydney Kom and Associates, of Montreal. After several months of study, the consultants recommended the purchase of the computerized picking machines from Mobility Systems, of California.

Once the materials-handling system had been selected and basic planning information provided by the warehouse consultants, full-scale work was commenced by Hydro's architects.

The building was designed as a high-rise structure with 26 feet of useable height in its 140,000 square feet. This compares with a maximum height of 16 feet in the old facility.

Precast, prestressed concrete construction helped to reduce the number of columns and additional space was obtained by reducing the width of aisles by more than half.

Another feature of the warehouse is a sophisticated three-level sprinkler system in the storage racks which, together with smoke curtains at ceiling level and powerful exhaust fans, provides excellent fire protection.

Architect Nick Stasios says one of the most unusual features of the warehouse is the in-floor electric heating.

What Hydro did was employ a low-current system using off-peak power to heat the warehouse. Low current was chosen over a high-current system to minimize interference with the delicate electronics of the guidance system. Basically, the heating system consists of a sand reservoir four feet deep under the floor. The sand is covered with electric heating mats on top of which is about a foot of concrete. The mats are heated at night and the sand and concrete retain the heat, releasing it gradually during the day.

But what happens on a cold wintry day when trucks are being loaded at the 24 ramps? Well, the consultants thought of that one, too. Each of the loading ramps has a vinyl curtain which literally seals the building to the truck. Overhead blower heaters are turned on to maintain heat when the warehouse doors are open. Work goes on in shirt sleeve comfort — rain, sleet, snow or shine — to keep goods rolling to maintain the power system. □


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The Powerhouse

It's hardly a Casa Loma, but by modern day standards the Toronto Power plant has its own architectural excesses.



In addition to his business interests, Sir Henry Pellatt had a long association with the Queen's Own Rifles and commanded the Canadian contingent at the coronation of Edward VII.

One of the earliest hydro-electric plants to tap the Niagara River — the Toronto Power generating station — has been closed down for economic reasons.

A masterpiece of engineering for its time, the plant has an impressive row of tall Corinthian columns. It was built in 1906 by the Electrical Development Company, an organization headed by two of the more colorful characters of that era, Sir William Mackenzie and Sir Henry Pellatt. In its early days, it was operated by the Toronto Power Company, a subsidiary of the Electrical Development Company.

The station is located about a half-mile above the Horseshoe Falls and sits on land reclaimed from the swirling waters. It was bought by Ontario Hydro in 1922.

Toronto Power had an initial capacity of 91.8 mW and operated at 25 cycles to meet industrial needs on both sides of the border. One of the stipulations of the company's franchise was that 50 per cent of its output should be retained for Canadian manufacturers.

However, it wasn't without angry words and lawsuits that Ontario Hydro was able to acquire power from the private producer.

So serious was the situation, that Ontario Premier E.C. Drury wrote to Toronto Power in 1918 demanding that it obey an order-in-council to deliver 25,000 h.p. to Ontario Hydro over its licensed amount. Mr. Drury pointed out that extra water required to develop the power was available under international treaty.

In yet another angry exchange, Mr. Drury informed Toronto Power: "There is, and can be, no question of giving you the right to use water in excess of that required to develop 125,000 h.p. and to sell that power to Hydro or anyone else at current prices. This water belongs to the province.

"We ask you to take it and, by means of your machinery, to turn it into power and deliver this power to our Hydro Commission for which service we are willing to pay you fairly. We are not, however, willing to give the whole crop to pay for the services of the thresher. That is what your proposition amounts to. I need not tell you

that Pellatt built

A loggia at one end of the plant affords a magnificent view of the rapids just above the Horseshoe falls.





Coverall-clad workmen mingled with dignitaries at the placing of the Toronto Power plant's cornerstone in 1906.

that we have no intention whatsoever of accepting it''.

Sir Henry Pellatt is perhaps best known in Toronto as the builder of Casa Loma. But he was involved in many extravagant and frequently profitable business ventures, so much so that he was often fondly referred to as Pellatt the Plunger.

At the age of 20, he formed the Toronto Electric Light Company, and secured a contract to install 32 arc lights downtown.

He later formed the Electrical Development Company and the Toronto Niagara Power Company, and served as a director of many of Canada's leading industries.

Until construction began on the Toronto Power plant in 1903, the bed of the Niagara had never been explored and reclaiming 12 acres of land from the river seemed an almost impossible task. At the time, the river's depth varied from eight to 24 feet with a velocity as high as 22 feet a second. The area to be reclaimed was in the swiftest part, just where the torrent gathered speed for its final plunge over the precipice.

Cofferdam construction was hailed as a triumph of skill and courage. It took a year to complete the 2,200-foot-long structure and dewater the forebay.

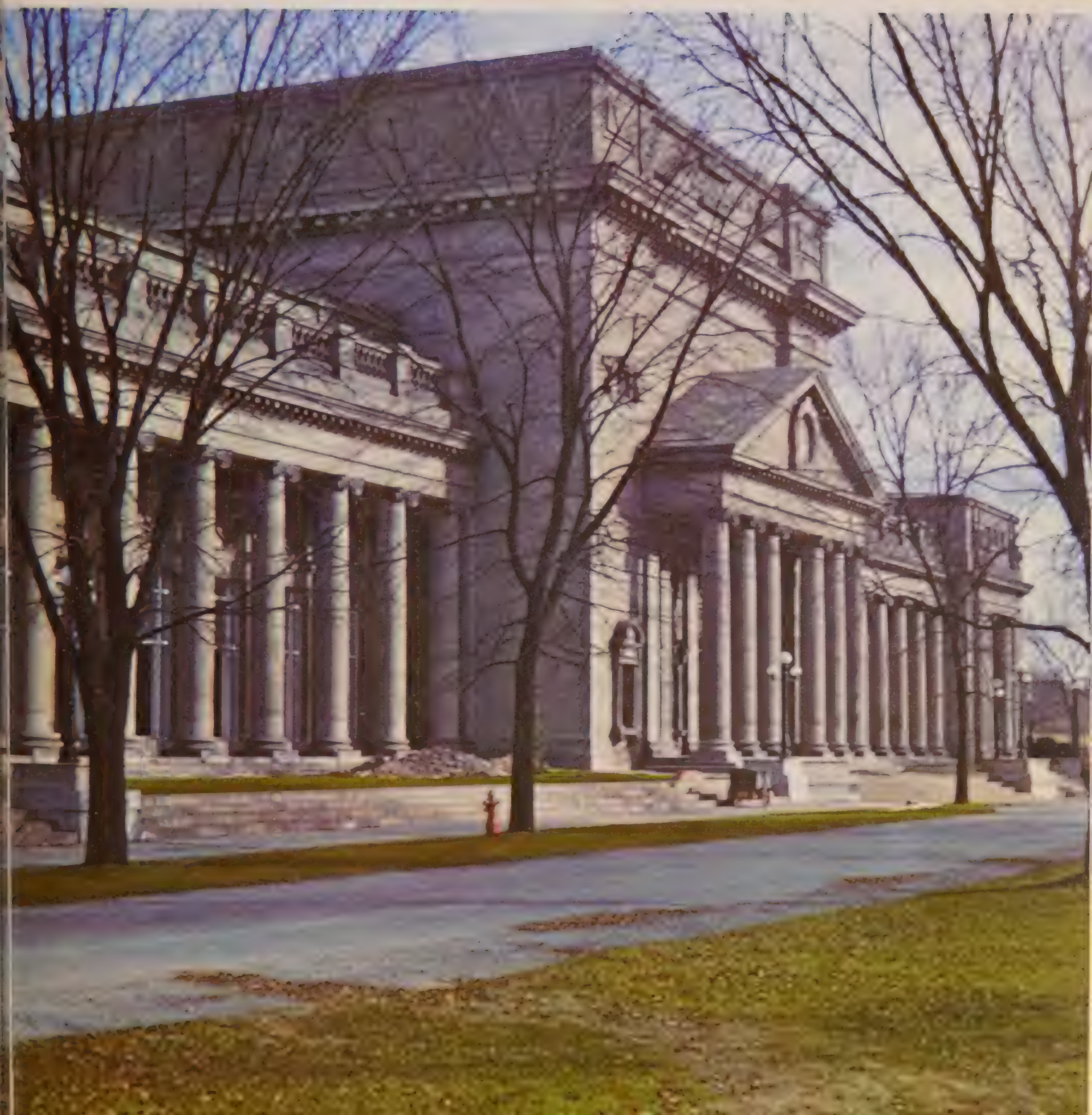
The main plan differed from that of other companies on the Canadian side of the river in that it was decided to bring the turbines to the water rather than the water to the turbines.

Building the tailrace channel proved to be one of the most daring feats of all times on the river. It involved sinking a shaft at the brink of the falls and a 700-foot tunnel to connect with the plant's main discharge tunnel, which is 2,200 feet long and 33 feet in diameter — at the time, the largest bore in the world.

The design of the powerhouse is imposing. Few buildings in North America equalled it at the time. Built of Indiana limestone, the structure is 500 feet long and 70 feet wide. A loggia at one end affords a magnificent view of the rapids just above the falls.

Although production has ceased at the plant, there has been no decision on its eventual fate. Two of its 11 original units are still serviceable and will be kept in running condition until a final decision on Toronto Power's future is reached.

Below: plant's Corinthian columns present an impressive sight to the thousands of visitors driving through the Niagara parks system each year.



OWNERSHIP

OMEA delegates overwhelmingly approved possible court action to decide the $800 million question of who owns Ontario Hydro.

A four-barrelled resolution was approved by delegates in a session punctuated by charges of "confiscation" of municipal utilities' equity in Ontario Hydro and pleas to "get tough".

Delegates approved tacking a rider on the original resolution which urges that "this matter be taken to the courts if necessary."

The resolution also:

—asks the Ontario Government to issue common voting stock certificates in the new Ontario Hydro corporation to each participating municipal electric or public utility "in proportion to the total equity each such utility holds in Ontario Hydro."

—urges that "the board of directors of the Ontario Hydro corporation be elected by the shareholders" and

—as an alternative to issuing voting stock, the OMEA asks that the Ontario Government be required "to pay in cash to each municipal electric or public utility the recorded value of its equity in Ontario Hydro" along with interest.

The resolution represented a consolidation by the resolutions committee of similar resolutions submitted by three OMEA districts. The amendment calling for possible court action was introduced by R. K. Walker, chairman of Streetsville PUC.

Delegates approved another resolution, introduced by J. L. Christie, of East York, authorizing the OMEA board of directors to make assessments against municipal utilities to finance possible legal action, "including engaging of counsel or other professional assistance."

Total municipal equity includes debt retirement payments by municipal utilities and funds set aside on their behalf to stabilize rates and meet contingencies such as low water levels. This year equity also includes the levy of a capital contribution charge in the wholesale cost of power, which was approved by the OMEA last fall to help Ontario Hydro reduce its borrowing requirements for system expansion.

The initial Task Force Hydro report asserted that "control and ownership of the Hydro Corporation should continue to reside with the Government of Ontario," but the OMEA strongly opposes that view.

Willard Richardson of North Bay said that Energy Minister Darcy McKeough, who addressed an OMEA-AMEU luncheon the previous day, had made clear that the people of Ontario own the Hydro system. "We believe differently," he said. "We (the municipal utilities) are the primary owners of Hydro."

Mr. Richardson urged that an injunction be sought by the OMEA against the Ontario Government preventing the operation of Ontario Hydro until such time as the government has acquired the assets of the Hydro corporation. No action was taken on his proposal.

He said the government action in setting up the Hydro corporation was "in the realm of confiscation."

"We expect this sort of treatment in South American banana republics but not in Ontario," he said.

Mr. Richardson said North Bay has about $3,000,000 equity in Ontario Hydro and a total indebtness of about $2,000,000 for its North Bay distribution facilities. "If we are paid off (by the government), we would have $1,000,000 for future expansion.

Ruth Donohue, chairman of Sarnia Hydro, opposed the resolution. "You are protesting too much in my opinion," she said. "I think you are jumping the gun on the whole thing. I'm sure you are not going to get money from Ontario Hydro or the Ontario Government."

An unidentified delegate read into the convention record an OMEA statement issued after the February 14 announcement of Ontario Hydro's board of directors. Two OMEA representatives were appointed to the board.

The statement alleges that "the Ontario government is on the verge of administrating $800 million right out of existence."

"If a satisfactory solution is not found, the municipal utilities can test the ownership of the electrical system in front of the courts," the statement reads.

"We are the principal owners of Ontario Hydro," said the delegate, who strongly urged support for the resolution.

"I think our action should be in the highest court in Canada, not the highest court in Ontario," Mr. Richardson interjected.

Dr. R. H. Hay of Kingston, who earlier outlined the proceedings of the Ontario Energy Board which is preparing to hear Hydro rate applications, said broader issues are involved.

"We are being subjected to a smooth, sophisticated and suave performance," said Dr. Hay. "We are being shafted. We are being seduced."

Dr. Hay said the capital contribution approved by the OMEA last fall as a "specific sum" may not be acceptable to the new Hydro Corporation and he demanded that the amount be shown as a "specific item" on 13th power bills.

"What's wrong with the old formula—power at cost?" he asked. "Why in the name of thunder do we need that phrase "lowest feasible cost". He attacked "the lovely weasel word feasible" as being subject to various interpretations.

"Let's not forget that we've got to keep the pressure on Hydro," he said.

R. G. Pinder of Oshawa charged that regional government there had taken over the water distribution system operated by the municipal utility, which represented an investment of between $5 million and $6 million. "We got nothing for it," he said.

Anthony Green, of Oakville, criticized the wording of the resolution as being "too strong" although he said he basically agreed with it.

A. W. Green, of Windsor, however, accused Mr. McKeough of giving the utilities a 'brushoff'. "We mean business in protecting the interests of the people who elected us."

An unidentified delegate urged the OMEA to 'be tough' and declared that the policy of the government was to 'divide and conquer'. "Unless you take strong action today, you will be nothing."

Mr. Christie introduced his motion calling for financial assessments to back possible court action by urging utility commissioners "to use politics as a weapon". He said OMEA members should

AT ISSUE

The 65th OMEA-AMEU convention dealt with such issues as ownership, equity, representation on the Board of the Hydro Corporation, restructuring of municipal utilities, energy supplies and material shortages.



et their own MPPs know that "we are pre-ared to work against the government." 'That's the kind of action they will listen o," said Mr. Christie.

R. R. Horkins, chairman of Toronto lydro, asked how much money was nvolved in taking legal action and said he wasn't prepared to sign a blank cheque."

One delegate declared the issue was dollars or principles' and another said: For the first time in my life, I'm willing to gn a blank cheque."

When the Christie resolution was pproved by delegates, the Sarnia ommission went on record as opposing it.

Standing ovation for Gathercole

Hydro Chairman George Gathercole pledged to work for a continuing high level of co-operation between Ontario Hydro, the OMEA and the AMEU during his remaining months in office.

Mr. Gathercole was given a standing ovation by delegates after a speech in which he defended Hydro's actions in the past, outlined progress over the years and warned about future problems.

"Change will come, and we will be obliged to adapt to it, and out of it will, I hope, develop an even stronger partnership," he said.

"We should not delude ourselves that changes in organizational structure, the appointment of review agencies and public participation are going to eliminate all the problems. The long delay in our plans for an EHV transmission system to deliver the output of new power stations has still not been overcome."

Mr. Gathercole said Hydro was committed to making public participation work.

"If we fail, or if the public is not prepared to support the compromises and

trade-offs involved in reconciling new power facilities with environmental concerns, then the consequences will be severe."

He said the government and the elected representatives of the people must be the final arbiters. But Hydro and the utilities have a responsibility to make the positive side of Hydro's endeavors clear.

"I strongly support the position taken by Ernie Alexander, Doug Seath and others in the OMEA and AMEU that the municipal utilities should involve themselves in hearings in which Hydro proposals are being considered and reviewed."

But Mr. Gathercole warned that unless a pattern of public participation was created which avoided extended delays and frustration, "we shall have to learn the hard lessons experienced by utilities and consumers in other jurisdictions."

He referred particularly to the four-and-a-half years already spent trying to determine the best route for the Nanticoke-to-Pickering transmission line.

"Public participation involves a much longer lead time and we are doing our best to make allowances for it. But progress must be made or we shall have imposed upon us the ridiculous situation of having power plants capable of producing electricity without the lines to deliver it to the people who urgently need it. The cost of delay can be incredibly expensive and cannot be measured just in terms of dollars."

Mr. Gathercole described 1973 as his most difficult year and he expressed appreciation for the confidence and support shown in the Commission by the member utilities.

He described the inquiry into the Hydro head office as particularly trying and said the Select Committee and the media were "unjustifiably critical."

Mr. Gathercole said that had the head office building been deferred one year it would have added $4 million in construction costs and many additional millions in cumulative higher interest payments.

"If we mismanaged the deal for the new head office there might be at least a few people who would like to have that type of mismanagement."

Mr. Gathercole added that the Select Committee chairman, while critical, acknowledged to the legislature that in many ways the committee's activities had been more destructive than constructive.

Outlining some of Ontario Hydro's achievements since 1961 when he joined the commission, Mr. Gathercole paid tribute to the employees who had helped Hydro to pioneer the Candu nuclear system, saying it took "tremendous talent, hard work, toil and guts.".

"There were doubters then, some who could be numbered among the head office critics. While we recognize that the road ahead will be far from smooth, we are entitled to feel gratified with the measure of success that our nuclear program, in partnership with AECL, has achieved."

Mr. Gathercole said that, for him, one of the most satisfying of Hydro policies had been the encouragement given to the development of a new Canadian manufacturing technology and capability.

"In the last dozen years, a new industrial structure has come into being to meet Ontario Hydro's increasingly sophisticated and highly exacting needs. These include a range of products from zircaloy tubes and uranium fuel bundles to 750-megawatt turbo-generators."

McKeough defends Hydro board

Energy Minister Darcy McKeough defended the government's appointments to the new Hydro Board and told delegates that the board's composition makes it very explicit that Ontario Hydro is owned and operated by the people of Ontario.

In an address to the Tuesday luncheon, Mr. McKeough commented on OMEA concerns about the ownership of Hydro and the fact that the OMEA did not receive the number of appointments on the board of directors that the association considered appropriate.

"Our major concern is that there should be membership of the board of directors that will assure the protection of the interests of the people of Ontario who, in the final analysis, are the real owners of the electrical generation and distribution system in this province," said Mr. McKeou

"The protection of that interest require that there should be people who are 'in house' — who have a real grasp of the needs and the problems of the provision o electric energy to the people.

"But, equally, there must be representation of the ultimate owners — the people themselves — who can assess Hydr responsibilities from the perspective of the ultimate users — the people themselve

Mr. McKeough felt that the redefining o Hydro as a crown corporation would do this. He said six of the appointments to the board were 'in house' — persons who have a commitment to the aspirations of Ontario's electrical generation and distribution system.

He described the new board as "a micr cosm of what is good about Ontario."

Carving... and a citation, too

Hydro chairman George Gathercole was given standing ovations at two separate sessions of the OMEA-AMEU convention.

He was honored by the delegates for what was described as a highly significant contribution to Hydro in Ontario.

Mr. Gathercole was presented with a special citation from the AMEU and an Eskimo carving from the OMEA. Referring to the citation, he said it was not really for him alone but for the members of the Hydro commission who had worked so diligently over the years.

The citation to Mr. Gathercole reads: "As a token of the esteem and admiration for able leadership, integrity and courage displayed during his years of office. Throughout a period of rapid social and technological change and a degree of expansion without parallel in its history, he continues to uphold the ideals and traditions which have motivated Ontario Hydro since its inception."



arcy McKeough . . . "new board a microcosm of what is good about Ontario."

"It represents the personal concerns of he citizens, the ideals of the environ- nentalist, the rigorous discipline of the cientist, the penetrating analysis of the anker and the tough business acumen of ne industrialist.

"All of these aspects of life in Ontario re represented and if the new board oper- tes as we think it will operate, it will oncurrently represent the best aspirations f the citizens, the distribution utilities and ne tough, technical and managerial skills eeded to assure that it serves the people f this province and serves them economi- ally and well," he said.

Mr. McKeough said he did not wish to see a master-servant relationship develop between the Ministry of Energy and Ontario Hydro now that a crown corporation was established.

The issue of individual responsibility also applied to the OMEA and the AMEU. He noted that a township in Eastern Ontario was sufficiently unhappy with OMEA policy to withdraw from membership, and also appealed to his office. He felt it was not his role to interfere, just as it was not his role to interfere in the current Hydro-Arnprior dispute.

"Matters of this nature should be worked out by Ontario Hydro or the OMEA and are not, in my view, an appropriate area for the involvement of the ministry."

Mr. McKeough added there had been great co-operation in the past between the OMEA, AMEU and Ontario Hydro and that the same co-operation would hopefully continue.

"I tend, indeed, to the view that the informal relationships that have existed in the past might properly be formalized. I tend also to the view that it might be preferable to have quarterly meetings at the most senior level at specific and agreed times at which areas of mutual interest and responsibility could be dealt with."

Discussing the restructuring of public utilities, the minister said he felt the findings of the restructuring committee were basically sound but he did not wish to rush the terms of implementation.

"I think there should be a good interval for examination and discussion between you, Ontario Hydro and others. And at such time as agreement emerges, and it is concluded that additions might be made to the productivity and efficiency of our electrical system in Ontario, presumably the principles enunciated might be applied to specific municipalities."

Mr. McKeough also touched on Canada's energy problems and the need for co-operation between provinces in economic development. "If we hold the price of oil, process our resources and strengthen our capital position, we can employ our people, create capital and build an economically powerful nation."

He added that Ontario and other provinces want secure supplies of energy in adequate amounts and at a reasonable price. But reasonable price did not necessarily mean a low price. "We know, for example, that we in Ontario are not going to be able to hold the price on electric energy. But we equally know there will be no compromise, in terms of electric energy, with our basic premise that electricity must be delivered to our citizens at the lowest feasible cost.

"And we also know that we are going to assure, to the extent possible, that those efficiencies are practised that will assure those costs are held to a minimum."

new presidents

Strong voice is vital—Bowker

At 40 years of age, Arthur James Bowker will be one of the youngest OMEA presidents to take office.

But this tall, soft-spoken professional engineer, who doesn't particularly care for air travel although he earns his living in aerodynamics research with the National Research Council, gets upset when people start talking about getting younger men involved in the OMEA's upper echelon.

"It's time they stopped talking about getting younger men—or for that matter older men—and picked people for what they have to offer," he says.

Art Bowker has a lot to offer.

A champion of the power-at-cost principle, Mr. Bowker first became involved with the Hydro organization in the 1960's when he joined a group known as the Suburban Ottawa Community Action Group—Hydro. The group felt that urban areas around the nation's capital were paying too much for electrical service.

At the time, Nepean and Gloucester townships were a part of the Ontario Hydro rural system, and, says Mr. Bowker, a comparison with the rates between the townships and Ottawa was really invidious.

Mr. Bowker says it soon became obvious that the only solution to the problem of high electrical rates was for the townships to form their own utilities. Nepean Township set up its own system and after a referendum, Gloucester Township Council appointed Mr. Bowker chairman of a committee to establish an electric utility.

Mr. Bowker was appointed the utility's interim chairman in 1965. He was elected to the commission and became chairman in 1966. He's been chairman ever since.

"It soon became obvious that the OMEA was an important force from the municipal point of view in Hydro in Ontario. It took me only one convention—the one in 1966—to realize that all the useful information municipal utilities were getting came from this association, and I knew that this was the outfit and I wanted to get involved," Mr. Bowker says.

Involved he became. He was elected a director of the Eastern Ontario district association that year and became its president in 1971. He also served two years as district president.

Now, as president of the provincial body, Mr. Bowker sees the OMEA's role becoming increasingly vital with Ontario Hydro's new status as a corporation rather than a commission. He says the OMEA will become even more important as an informed source of both criticism and support for the Ontario Hydro Corporation.

Mr. Bowker says there will be a need for strong representation of the municipal viewpoint at such activities as rate review hearings and public hearings concerned with Ontario Hydro's generation expansion program. Indeed, he says, if he were to pinpoint one role for the OMEA during his tenure as president, it would be providing a strong municipal voice in the affairs of Hydro.

"Participation in public hearings is a new activity and, unfortunately, will cost more money. However, the OMEA will have to face up to the need for this effort.

"In many ways, much of this activity is really a continuation of the work the OMEA has carried on in a slightly different manner over the years.

"For example, the OMEA has always been interested in power at cost—that's the very basis the association was founded on—and that's what the rate review hearings are all about.

"The OMEA has always been interested in adequate generating facilities to meet the electrical needs of the people of Ontario. The association has always tried to take the long-term view to see that the customers of the province are well served in the future. And that's what the hearings into Hydro's proposed expansion program are all about," Mr. Bowker adds.

"Take, for example, the actions of the OMEA's power costing committee (he was a member of it). That committee was, in effect, a form of rate review board. It used to get some advance notice of Ontario Hydro's thinking, would assess the situation, and based on that assessment would sometimes press for changes."



A. J. Bowker

Born in Lethbridge, Alta., Mr. Bowker moved to Vancouver when he was still in elementary school and graduated in mechanical engineering from the University of British Columbia in 1956. He immediately took up a position with the National Research Council. In fact, he boarded an airplane for Ottawa right after the graduation ceremony.

He met his wife, Pat, at university and they were married in Victoria. They have two children, a son, Grant, 18, who wants to follow in his father's footsteps and become an engineer, and a daughter, Janet, 15, who is interested in architecture

During his student years, Mr. Bowker worked at a variety of jobs from laborer in a paper mill at Ocean Falls, B.C., to lumber camps, and was a fry cook for several summers around the beaches and midways in Vancouver.

The incoming president is perhaps best known within the association for his role in the "flying circus", a group of OMEA and Ontario Hydro representatives, headed by power costing committee chairman Archie McGugan, who toured district meetings

take office

st year explaining to utilities the comple-ties of capital contribution and the hasing out of the return on equity. But his avels were just a prelude to the year head. For a man who doesn't particularly ke to be on the move, he expects to log bout 30,000 miles in the 12 months as the MEA's chief ambassador.

Bradley stresses co-operation

Now that I'm president, they'll have to get someone else to play O Canada."

Ivan Bradley, manager of Waterloo Hydro and new President of the AMEU, wasn't exactly joking. As an accomplished pianist, he is often called upon to play the national anthem at AMEU meetings, not to mention sing-songs in after-hours gatherings.

A youthful-looking 50-year-old, Mr. Bradley enjoys his home and family and spends countless hours at the piano and his radio transmitter.

"I've been a radio ham for years," he says. He is even taking Spanish lessons so he can talk to operators in Central America.

The new AMEU president brings 20 years of utility experience to the job. He was born in Thorold and lived there until 1943 when he joined the RCAF and served overseas for three years.

On his return to Canada, he attended Queen's University and graduated in electrical engineering in 1951. For the next three years, Mr. Bradley worked for Canadian Westinghouse helping to develop an electronic torpedo for Nato. He then joined Waterloo Hydro and has been its manager for 16 years.

From the start, Mr. Bradley has been an active member of the AMEU. He's a former director and past president of district 6. He was also a director-at-large on the AMEU board representing medium-size utilities and has served on various committees including street lighting, marketing, pension and insurance as well as the external advisory board.



Ivan Bradley

While the new president recognizes important differences between the OMEA and the AMEU because of their different roles, he also sees the need for strong ties between the two bodies, Ontario Hydro and the provincial government.

"It is absolutely essential that the two associations continue to co-operate and co-ordinate their various activities," he says.

"Formerly, we had a triumvirate composed of the OMEA, AMEU and Ontario Hydro. Now we also have the Ontario government. It's important that the AMEU retain its traditional good relationship with Ontario Hydro and, in addition, be prepared to give good and responsible input to the Ontario government and its agencies at the appropriate time and at the correct level."

Mr. Bradley feels that while the political arm—the OMEA—deals with the Minister of Energy, the AMEAU should work through the deputy minister.

The AMEU president has some firm beliefs on the restructuring of utilities and feels the subject will be a major concern during his term of office.

"A person would, in my opinion, be overly biased not to agree that there have been too many utilities, many of which were unable to produce a desirable level of service on their own without the help of the Ontario Hydro power district and, indirectly, that of other larger utilities."

Mr. Bradley feels some sort of rationalization is needed to meet future growth and conform to new regional boundaries. He's also concerned with possible delays in the restructuring process and feels that changes should be made as soon as possible to avoid staff problems and customer unrest.

"I am not a person who believes in change, for change's sake. Change should follow deep and thoughtful study. Once a utility is destroyed, it can hardly be put back together again."

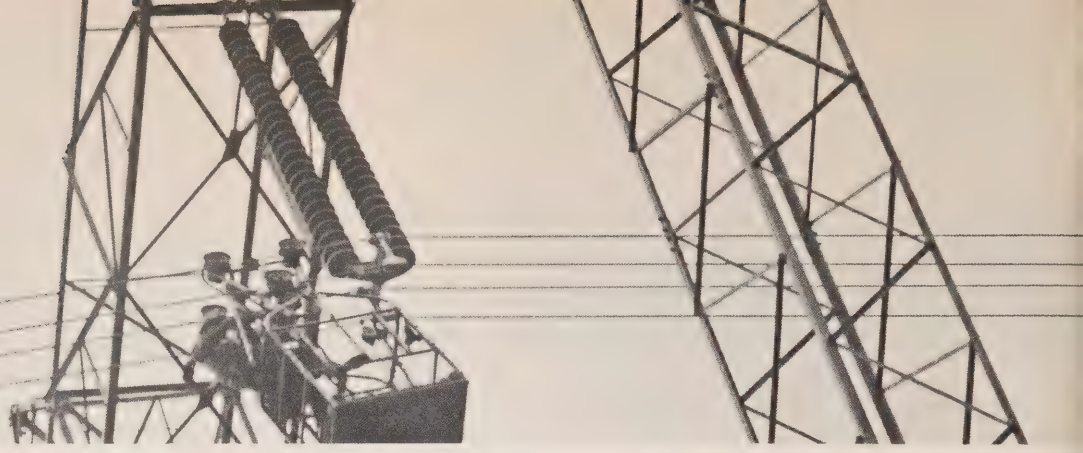
Mr. Bradley emphasizes that the small and medium-size utilities have made their proportionate contribution to the development of the Hydro system. "While they may have lacked what is often referred to as big city business acumen, they've been strong on common sense and integrity."

Looking to the future, Mr. Bradley feels the municipal utilities will have to expand and upgrade their distribution systems to accommodate loads not even expected five years ago. But the energy crisis has thrown all previous predictions to the winds.

Among immediate problems, Mr. Bradley says the AMEU must tackle shortages of materials, such as cedar poles, cable and transformers which are having an adverse effect on new construction and maintenance.

"Our problems in this area may be offset partly by delays in the construction industry generally. Large apartments are now taking longer to complete—perhaps our delays will coincide with theirs," he adds.

along hydro lines



$15 billion expansion

Ontario Hydro estimates it must expand its province-wide power system by 92 per cent to 31.5 million kilowatts during the next eight years, "to meet the requirements of the people of Ontario for electric energy."

Total estimated capital expenditures for the period 1974-1982 in the order of $15 billion are foreseen.

In a written submission to the first of a series of hearings before the Ontario Energy Board, Hydro stated that it also expects rates to increase at least 10 per cent a year over at least the next three years to meet rising costs and maintain financial integrity.

The hearings, open to the public, were established by authority of the Ontario Energy Board Amendment Act of July 17, 1973. The Act provides for the establishment of a mandatory public review process in respect of any rate change to take effect on or after January 1, 1975. The board was also empowered to review Hydro's generation program, its financial policies and objectives.

The hearings are expected to extend over the next several months.

More heavy water

Ontario's Energy Minister W. Darcy McKeough has announced plans for a four-unit extension to the Bruce Heavy Water Plant.

Addressing a gathering at the Bruce development of provincial and local government officials together with representatives from industry and Ontario Hydro, Mr. McKeough called on private industry to get involved in the financing and construction of units five to eight at the heavy water plant.

He said any participation by private industry would be in conjunction with the Lummus Company of Canada because of its experience in the field.

Two units, each with a capacity of 400 tons a year, are operating at the plant and two additional units were announced last June. With completion of units five to eight, the plant's capacity will be 3,200 tons a year. The eight units are slated to be in operation by 1979.

At the same Bruce meeting, Hydro Chairman George Gathercole announced interim grants to Port Elgin and Kincardine of $250,000 each. In addition, Hydro has set aside $75,000 to help rebuild a Tiverton street and is discussing with the Ministry of Transportation and Communications and municipal officials the problem of rebuilding 30 miles of municipal roads in the townships of Bruce, Kincardine, Saugeen and Greenock.

Outlining the grants to the municipalities, he said that a special grant totalling $1 million allotted in equal installments over a 10-year period came into being in 1970. "It was recognized that, in view of the expansion program announced last June, a change had to be made in the 1970 formula to provide larger sums of money and extend the time period," Mr. Gathercole said.

To this end, he added, a study of the effect of the complex on the surrounding area is under way, but results will not be known until mid-summer. In the interim, the grants are being made to Kincardine and Port Elgin and will be taken into account when the study is discussed.

Management update

Managers and senior staff members from utilities across the province will be on hand at Queen's University in Kingston, June 5, 6, and 7, for the Association of Municipal Electrical Utilities annual summer conference designed for management.

Billed as a "management update", the conference is being held in conjunction with the university's school of business and will take a look at purchasing and inventory maintenance techniques for utilities.

Another session will examine new equipment available to utilities such as new styles in pole-line hardware and insulation techniques. Latest developments in building materials will also be studied,

Regional managers

Ontario Hydro's Niagara region marketing manager, P. J. (Phil) Garlough, has been appointed regional manager in Georgian Bay region. R. S. (Ray) Griffin, who held the top administrative post in Georgian Bay, has been transferred to Niagara region to succeed retiring manager W. J. (Jim) Jackson.

Mr. Garlough joined Hydro in 1944 as a junior engineer and was appointed an assistant in the Niagara region consumer service department four years later. In 1949, he was named consumer service superintendent in the original Eastern region, headquartered in Ottawa. When the original Eastern and East Central regions amalgamated in 1963, he was transferred to Belleville.

A year later, he moved to the head office consumer service division and after another year became consumer service and sales engineer in Northeastern regior Mr. Garlough was appointed Niagara region marketing manager in 1969.

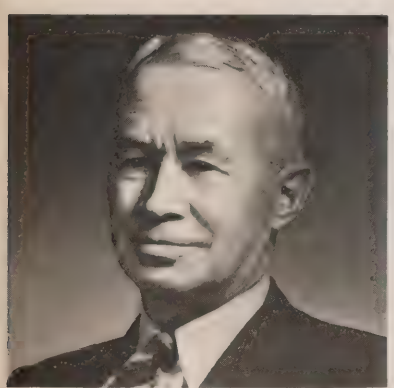
Mr. Griffin joined Hydro in 1937 as a meter and relay engineer and has spent most of his 36-year career in Niagara region. He was transferred to Queenston 1941 where he worked in mechanical maintenance on the Niagara plants and was plant superintendent at the Sir Adam Beck-Niagara generating stations. He late became regional operations engineer before taking over at Georgian Bay.

Mr. Jackson was regional manager for nine years in Niagara region, where he spent most of his 35-year Hydro career. H joined Hydro in 1938 as a meter and relay engineer and worked in Toronto, Londor

Hamilton and Burlington before joining the ormer operating department in Toronto in 944.

Three years later, he moved to Hamilton s regional operations engineer and was ppointed regional manager in 1964.

Hearn honored



Dr. R.L. Hearn

ntario Hydro's former chief engineer, eneral manager and chairman, Dr. Rich-d L. Hearn, has another achievement to dd to an already long list—appointment the Order of Canada.

Dr. Hearn's name appeared on the new ear's honors list. He retired from Hydro in 956 after a career that spanned more an 40 years. He lives in Queenston.

Dr. Hearn, 83, was first chancellor of rock University from 1967 to 1969, and is ne of only two Canadians who are honor-y fellows of the Institution of Electrical ngineers in the U.K.

The other Canadian fellow is Dr. W.B. wis, who retired last year as senior vice-esident of Atomic Energy of Canada mited.

utting losses

ntario Hydro's acting director of security, erry Kileeg, has called on municipal utili-s to stop accepting losses as a way of life and to involve their employees in a campaign to prevent loss through theft and vandalism.

Mr. Kileeg told District 4 delegates that utilities have safety campaigns, sales campaigns, water-heating campaigns and now are promoting the efficient use of electricity. However, he suggested, security campaigns had been largely neglected.

Mr. Kileeg said that in 1973 there was a 6 per cent increase in crime in Metro Toronto and Ontario Hydro and the municipalities are facing ever-increasing threats of outside crime, such as copper thefts.

"We face the theft of small tools and equipment. We face the theft of vehicles. We face the threat of break and enter in our storage compounds and we face the threat of damage, be it careless, irresponsible or malicious.

"Insulators, meters, street lights are damaged. We even see the flags in front of utility buildings being stolen. Downtown offices these days are facing walk-in thieves.

"How do municipal utilities fare? Do you know? Are you watching your inventory? Are you watching the losses in street lights, replacement costs? Are you watching the damage to meters? Have you watched the losses in material—kept your eye on pilfering? Have you protected your copper?" Mr. Kileeg asked.

Year of crisis

Despite wars and Watergate, 1973 will undoubtedly go down in history as the year of the energy crisis—or at least the beginning of the energy crisis, says Ontario Hydro Chairman, George Gathercole.

Speaking at the District 4 meeting, Mr. Gathercole said that in the dying months of the year it became evident how intricately our economy and even our life-style is woven into the fabric of uninterrupted energy supplies—of electricity, oil, coal, gas and uranium.

"In Britain, the interruption in supplies of oil, coal and electric power has been catastrophic. Industries have been forced into three-day work-weeks with a resultant slash in pay cheques; families huddled together in one room to save heat and light; even television screens blacked out at 10.30 p.m.

"In the United States, energy shortages are causing grave economic dislocation and consequences.

"To be sure," Mr. Gathercole said, "many of these interruptions are inspired by political motives. There are those who believe the problems will vanish when the sheiks re-open the oil valves and the miners return to the pits.

"Helpful as this action would be—and in some time relief can reasonably be expected— it won't change the direction the world must now take."

Mr. Gathercole said that while no one could have foreseen the exact course of events that brought us to the present crisis, the changing supply-demand pattern was foreseeable and foreseen.

"For several years, Ontario Hydro has been emphasizing the need to strengthen our electrical capability in anticipation of the larger role electricity would play in meeting future energy requirements.

"When I first became associated with the Commission 12 years ago, Hydro had a dependable peak capacity of 6.1 million kilowatts. Today, it is 17 1/2 million kilowatts.

"In December, Hydro supplied a load of 13.7 million kilowatts, more than double the entire demand on the system just 12 years ago. That system capability has not come into being by accident. It has come about through the talents, competence, hard work and integrity of the entire Hydro team, including the municipal utilities," Mr. Gathercole said.

Change under way

Pending the designation of Ontario Hydro as a corporation with a new board of directors, much in the way of change was quietly fashioned throughout Hydro—and

in government, R. M. Dillon, Ontario's Deputy Minister of Energy, told the annual meeting of District 4, OMEA, in Toronto.

Mr. Dillon referred to the Committee on Restructuring Public Utilities whose report was subsequently presented to Energy Minister Darcy McKeough. "This should lay the groundwork for the reorganization of the retail distribution system in areas under regional government and, ultimately, throughout the province," he added.

He said the restructuring of the utilities is a "tremendous task" involving the co-operation of the OMEA, the AMEU, the Ministry of Treasury, Economics and Inter-Governmental Affairs, the Provincial-Municipal Liaison Committee and Ontario Hydro.

Mr. Dillon said much planning had been done for the first Ontario Energy Board public hearing (which opened January 21) for a review of Hydro's proposal to increase rates on January 1, 1975.

He added that for the first time government had received, and approved in principle, a comprehensive capital program. This program outlined the construction of generating facilities into the early 1980's.

"Negotiations," Mr. Dillon said, "are in progress which could lead to new sources of financing for major capital projects and increased involvement of Canadian industry through joint ventures in design and construction of Hydro generation and transmission projects.

"A comprehensive procedure for the involvement of the public in the location of generation and transmission projects has been worked out by Hydro in close co-operation with government and is now being implemented. In this respect, Hydro has taken the initiative and is in the lead in response to a perceived change in public attitude.

"Considerable progress," he added, "is being made in reshaping the Hydro system to enable it better to cope with the social dynamics of the 70's. I'm aware that it is far easier to plan for change than it is to put it into effect. Responsiveness to change is difficult enough for us, as individuals—it is more difficult for groups and organizations to adapt to new conditions."

OMEA statement

The OMEA issued the following statement in response to the announcement of the new Ontario Hydro board of directors:

The Ontario government is on the verge of administrating $800 million right out of existence.

The 12 members of the Ontario Hydro board include only two representatives of the OMEA.

Municipalities founded the system more than 60 years ago and through their electric commissions have built-up an investment in it worth about $800 million.

The association represents more than two million electricity consumers and its member commissions own about 70 per cent of the electrical supply system.

In its present selection of Hydro board members, the government has ignored the reality of the $800 million ownership factor. In effect, it is taking over the assets of the system it does not own.

Fair and lasting representation of municipalities on the board is essential to protect the basic rights of Ontario citizens to high quality electricity service at a reasonable cost.

The OMEA will request a meeting with Premier Davis to discuss the situation. If a satisfactory solution is not found, the municipal utilities can test their ownership of the electrical system in front of the courts. Through the courts, they can seek to obtain either proportional representation on the board, payment for the assets they have lost, or equal interest-bearing shares in the system.

municipal briefs

Chatham Hydro paid tribute to six long-term employees at the utility's annual dinner-dance. Honored were Robert J. Draper and William A. Coltart, for 35 years' service; Neil G. Murray, Edward C. Coyne, George A. Down and Peter J. Doddy for a quarter-century of service. Presenting the awards was Archie E. Stirling, who was just completing 54 years of elected service at various times as mayor, alderman, trustee and Hydro commissioner.

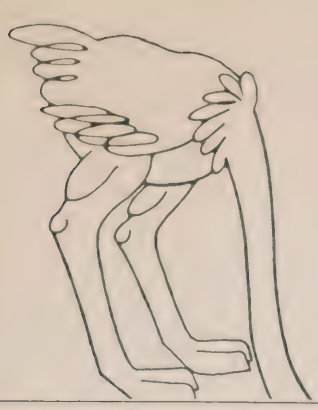
Elmo Curtis, the man who helped found London's Storybook Gardens, has died at the age of 71. Mr. Curtis was a member of London PUC for 21 years and served as its chairman six times. He was chairman of the Storybook Gardens Committee for many years and served on the board of the Western Fair Association, which named a rose garden in his honor. Mr. Curtis also served as a city alderman for 10 years.

It's not the gift, but the thought that counts. That old adage came to mind when Brighton PUC manager Charles Acker opened his office mail. One of the packages contained 23 letters from students at the local public school to express appreciation for the utility's safety program. Mr. Acker and two utility employees conducted an electrical safety program in the school.

Windsor Utilities Commission has voted to employ a full-time safety supervisor with a view to reducing on-the-job accidents. The successful candidate will undergo a period of training with the Electrical Utilities Safety Association.

Elmira PUC has unveiled preliminary plans for a $100,000 Hydro service building and given its manager, Ken Dunn, approval to seek a firm price on each of four proposed sites. However, the utility is still uncertain whether the building will be needed in the light of regional government reorganization.

Trenton PUC has said farewell to 43-year employee Charles Brownson, who was helping to provide local electrical service before the utility was established. At a testimonial dinner organized by co-workers, Mr. Brownson was presented with a color television set and other gifts. During his career, Mr. Brownson worked at everything from digging holes for wood poles to repairing meters and servicing appliances.



as don wright sees it

pring appears to be leaking out all over nd for us this means spring cleaning. 'hile more conventional folk are streak- g among the dandelions, it's time for s to trim the fat out of our files and dust e cobwebs off those tasty tidbits cked away at irrational moments over e winter but set aside from month to onth so that we might deal with ems of world significance.

The result is usually a dog's breakfast unrelated items which, individually, e too important to ignore and, taken ollectively, could cause an outbreak of omaine among the readership.

As an aperitif we might ponder the nplications of a by-law proposed ently by Sydenham Township which uld make it illegal to keep an ape on e premises. Not an overly punitive easure perhaps, from the point of view the number affected, but it all depends the point of view.

If we can accept the tenets of women's as being descriptive of the average ale, then at least half of the ladies in e township could be forbidden to rbor their husbands within township undaries.

■ Energy conservation continues to minate the headlines and there is food thought in that advertisement pub- hed by the British gas industry urging uples to share a bath. The ad shows a dy and gentleman in a tub over the ption "put a bit of romance into your th by sharing the water."

Termed vulgar by some and wizard by ers, the suggestion may not be as ed as it appears. Before we pull the g on the gas people, perhaps we ould consider the circumstances. B tish bath tubs, particularly in the tely old homes of England and Sotland, are reputed to be gigantic airs within which it is quite possible to ry out a wide range of aquatic sports cluding high diving and water polo. Ors, by comparison, are cramped to the nt where the Humane Society should ntfully be called in to examine the ght of our rubber ducks.

Under these circumstances it seems quite feasible that British couples should perform their ablutions in concert while barely striking up a nodding acquaintance.

More power to them, we say, and may Britannia continue to rule the waves. Or should it be waive the rules? But there is nothing odd about the British. Not like the ribald and perverted scene we used to conjure up for our children in what may have been our earliest attempt to save hot water. We refer, of course, to the three men and their disgraceful antics in the confines of a round, wooden tub. Rub-a-dub-dub indeed!

■ Strange how many problems continue to beset this little old world of ours, considering how the supply of experts seems to keep on expanding at a rate well calculated to achieve heaven here on earth by next St. Swithin's Day at the latest. And among those endeavours receiving an inordinate amount of attention is the production and distribution of electric power in the province. Perhaps this is because Hydro keeps on insisting that the problems associated with this kind of an operation are esoteric, many faceted and anything but black and white.

We writers don't like being confused by the facts. It's very difficult to view something with good old-fashioned alarm when there are two or three sides to a question. Even motherhood items such as energy conservation can be pretty exasperating when it comes to pinning them neatly down.

No doubt we all benefit from conserving energy and yet we're beginning to read stories about U.S. utilities seeking rate increases due to the success of conservation campaigns reducing the use of electricity.

Not much of an incentive to save but we're probably getting in over our heads here. Like the ostrich up top with its head in the sand suggests, we sometimes view things with something less than piercing clarity. But we're sick and tired of letting logic get in the way of our tunnel vision.

■ Safety at Hydro is taken pretty seriously and it's not often one finds anything to chuckle about in the sober-sided reports covering accidents. We refer to a recent case where an employee was savaged on one of his extremities by a wild animal. Sounds dreadful enough and yet there is something less than total tragedy in this particular report. It reads as follows:

"The employee changed his shoes in preparation for work at 8 a.m. Later in the day, upon investigation, he found a mouse in his boot which was still alive and had bitten him."

The heading, too, was succinct: "Mouse bite — great left toe."

Being an animal lover, much of our sympathy goes to the mouse. Hopefully, the employee was wearing fresh socks but one can't help wondering at the size of his boots. A foot replete with its five little piggies doesn't usually leave much room for stowaways.

■ On the subject of mice, we were edified no end by a mousy little morsel in our favorite scientific journal which we will pass along solely for its mind-boggling implications.

"The nude mouse", reads this item, "homozygous for the gene nu, has been hailed as the ideal animal for studying the immunological consequences of athynia. Besides being topless and bottomless, it is generally considered to have, at the most, a miniscule and grossly abnormal thymus."

The point is, if you ever set eyes on a topless and bottomless mouse doing a streak, you can be pretty sure it's sporting a rather unusual thymus.

■ Finally, we have half a dozen items dealing with generating stations and the dreadful effect of warm water discharges into Lake Ontario. All conjure up visions of the lake being turned into a Japanese bath house in the very near future.

Speaking for ourselves, any spare btu that finds its way into that lake can only improve the situation. Maybe the crawdads and mud puppies feel differently, but anyone who has dipped a toe into that liquid iceberg isn't likely to complain of the heat. □

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hydro news

May/June 1974

Ontario Hydro — the power to...

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What's a nice girl like you doing in a dump like this?

hydro news
may/june 1974

features

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22 Garbage? It's a hot item

Trials at Lakeview generating station will determine the feasibility of incinerating waste in a modern power plant.

29 Along hydro lines

Les Dobson, Editor

Paul Page, Design Direction

Allan Waddingham, Design

the cover

What, indeed, is a nice girl doing down in the dump? Well, Kathryn Gallagher is a Hydro employee and Hydro, after all, is pretty interested in garbage dumps these days. If you fail to see the connection, well turn to page 22.

Photo: Harry Wilson

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hydro news, volume 61, number 3

Published by Ontario Hydro, 620 University Ave., Toronto.

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Printed in Canada.

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UNIVERSITY OF TORONTO

ed with a rising population and anding industry, the need to conserve d agricultural land can scarcely be -emphasized.

actories now stand where fruit trees e flourished. Urban sprawl and ulation have taken many thousands of s of arable land out of production. ways, railways and pipelines are other nples of how industrial expansion has n place at the expense of the cultural environment.

ower lines also represent an oachment and the expansion of ro's high-voltage transmission line ork is coming in for more and more ism as the corporation strives to ire the necessary land.

rt of this opposition may stem from onceptions as to the amount of land e power corridors actually remove agricultural production. Unlike a way or a new housing sub-division, a smission line is not entirely mpatible with the production of food. s ranging from corn to tobacco and are flourishing beneath transmission across the breadbasket of Ontario. ly the land actually covered by the porting towers, plus a small area to v for the manoeuvring of machinery, is e unavailable for farming. High-voltage rs are placed about 800 to 900 feet t on a single tower line and the base of 0 kilovolt tower averages about 28 feet ure. The infringement of a multi-tower s correspondingly greater, but the egate effect of transmission lines on production is probably much less is commonly envisioned.

convenience is a problem. There is no tion but what the presence of towers farm can complicate such functions eed control and the manoeuvring of oment for seeding, harvesting and preparation.

addition to the physical venience, there is a fundamental imposition in interfering with the erty of people who ask nothing more to be left alone.



Responsive to change, Hydro acknowledges that procedures which have been equitable and successful in the past are not necessarily adequate today. Action is being taken to ensure that its policies are consistent with the needs and views of the agricultural community.

Information relative to the effects of power corridors over farm areas in Ontario is not generally available and Hydro is conducting studies to identify problem areas. These in-depth studies are designed to determine the actual impact of transmission lines on farming operations and they will include substantial input from government agencies and the farm community.

In addition, the Hydro board has approved a new and more flexible property acquisition policy that will help ensure that procedures and compensation formulae are more than fair to the people affected by Hydro's expansion programs. The new policy was worked out in close co-operation with the Ontario Federation of Agriculture and in consultation with several government ministries and major corporations.

Among its departures from previous practices, the new policy enables Hydro to offer affected property owners the choice of selling their land outright or retaining title and conveying an easement. In arriving at compensation, the new and more flexible guidelines also recognize the impact of transmission lines on farm operation.

Through the years since Adam Beck went to the country with the story of electricity and its potential as an aid to agriculture, Hydro has enjoyed a special rapport with the farm people it serves. If this relationship has become strained during the process of acquiring land for the present transmission line program, then Hydro is taking the right course towards setting things right—listening to the farmers themselves.

All the expertise and goodwill in the world will not render painless the process of acquiring the property of people who do not wish to sell. But the onus is on Hydro to ensure that the people affected are accommodated to the fullest extent possible by an agency which must also act in the best interests of the power users of the province. These include the farm industry which owes much of its efficiency to electrification. □

Hydro takes the

One of the most complicated yet important public hearings to take place in Canada, says Ontario Energy Board counsel



The stage was set this spring for Ontario Hydro's first formal application for rate increases under a full-dress public review process.

Since January 21, the Ontario Energy Board has conducted lengthy public hearings into Hydro's proposed generation program and its financial policies. Never have the broad range of Hydro's activities come under such searching scrutiny.

These hearings, however, were preliminaries to the main event—an intensive public inquiry into power costs and proposed rates.

"This is one of the most complicated, yet important public hearings that has ever taken place in Canada," says Robert W. Macaulay, counsel for the Energy Board and a former vice-chairman of Ontario Hydro.

Hydro set up a rate review department last year to prepare for the hearings. The initial submission on the 1977-82 generation program was contained in four volumes. Another bulky submission reviewed financial policies.

The two submissions were supported by weeks of testimony by Hydro experts called to give evidence before the energy board and by additional written reports.

The first phase spanned 35 days of sitting during which the initial submission was supplemented by 242 additional exhibits. Transcripts of evidence cover nearly 5,000 pages.

At stake is Ontario's electrical future.

Hydro estimates it must expand its province-wide power system by 92 percent to 31.5 million kilowatts during the next eight years to meet demands for electric energy. Total capital expenditures for the period 1974-82 are estimated around $16.7 billion. The program before the board, however, covers the period 1977-82 and will cost a estimated $7.4 billion.

Hydro's written submission states tha the corporation "also anticipates that in order to meet its rising costs and mainta its financial integrity it will be necessary its rates to increase in the order of at lea 10 per cent per year over at least the ne three years."

The hearings were established by authority of the Ontario Energy Board Amendment Act of July 17, 1973. For the first time, the Act provides for establishment of a mandatory public review proc into any rate change to take effect on or after January 1, 1975. The board was als

stand



The Ontario Energy Board panel holding public hearings into Ontario Hydro's submissions on its generation program, financial policies and rates includes, left to right: A.J.G. Leighton, A.B. Jackson, Q.C., who was recently appointed chairman of the Ontario Energy Board, and Dr W.W. Stevenson

ei powered to review Hydro's generation p>gram, its financial policies and objec- tes.

In winding up the first phase of the hear- ins, the board heard final arguments by M. Macaulay and by Pierre Genest, Hdro's counsel.

Mr. Genest said evidence confirmed the re ability and soundness of Hydro's load fcecasting procedures. He asked board m mbers to recognize that Hydro's load fcecast is valid and should be the basis of it expansion program.

"The evidence amply illustrates that Hdro's forecast track record is excellent," th Hydro counsel stated, "and the validity o hat forecast is the single most important is ue in these proceedings."

Mr. Macaulay suggested that the energy board consider alternatives to Hydro's expansion program, including reductions of $1 billion or $2 billion in capital expenditures, or the feasibility of delaying construction of proposed nuclear stations.

As a result, Hydro advised the board on March 21 it would require at least six weeks to prepare studies on the alternatives proposed by board counsel.

As alternatives to these proposals, Hydro suggested three other plans for study—deletion of the proposed Wesleyville station from expansion plans, replacement of the Bowmanville nuclear station with a fossil-fuel plant, or delaying the construction of four additional units at the Bruce nuclear station on Lake Huron.

In response, the board formally asked Hydro to consider two alternative proposals: (1) to defer construction of an 800-ton-a-year heavy water plant at Bruce which would necessitate postponement of eight proposed nuclear units, and (2) to convert the Bowmanville plant from nuclear to fossil fuel. For both alternatives, the board said Hydro should proceed with the oil-fired Wesleyville plant on schedule.

Mr. Macaulay proposed that Hydro seek more power from interconnected systems. But Mr. Genest told the board that Hydro cannot rely on neighboring electric systems to supply firm power.

New contracts are being negotiated with Manitoba Hydro for Northwestern Ontario, but Hydro has been told that Quebec needs most of the electricity it produces for its own use. Power from the James Bay development will not be available at least until the 1980's.

Hydro advised the board that U.S. utility systems would be unable to enter into firm contracts to supply power. In fact, U.S. systems are presently trying to buy a long-term supply of 3,000 megawatts from Ontario.

Mr. Macaulay suggested it would be impossible for Hydro to meet the obligations of its proposed program through public participation—the process by which Hydro seeks public approval for transmission line routes and station sites. He proposed that a more practical method be worked out.

Mr. Genest told the board that Hydro will make every effort to make its program work, and that plans should be given a fair trial before a fianl judgment is made. However, he said Hydro would welcome any



Robert W. Macaulay, counsel for the Energy Board, ponders over an argument.

constructive suggestions to improve the process.

In submitting the proposed program, Hydro covered the following areas:

Growth: Detailed Hydro studies indicated the demand and use of electricity will continue to double about every 10 years over the next decade or two.

"Hydro does not look upon growth or expansion as having any value in itself," said the submission. "Our responsibility, as we see it, is to provide the capacity necessary to meet the demands of the people and of the economy of Ontario for electricity....

"Experiences around the world today make clear the disastrous consequences of power shortages and our plans are designed to prevent the occurrence of these conditions in Ontario."

Planning process: In discussing the planning and decision-making process in detail, Hydro said studies of generation and transmission requirements have been made for the next 20 to 30 years. The results of these studies are tentative and general at present because of a wide area of uncertainty in predicting future power requirements, but they provide a guide to proposed expansion in the next 12 years.

When decisions are made to build new facilities, long lead times are required. Depending on the type of plant, it takes from 7 to 12 years between the decision to undertake a new generating station and the in-service date. Approximately seven years are now required for major transmission lines.

Hydro is already experiencing "substantial delays" in the commitment and construction of new facilities because of the time required to gain public acceptance of proposed transmission line route and generating stations sites.

"Such delays will decrease the reliability of electricity in Ontario at the very least," said the Hydro submission, "and appreciable protraction of such delays will result in virtually certain power shortages in the next decade that will take years to rectify."

'eliability: Hydro said forecasts of future ower demands are likely to contain some egree of error, although experience has nown that past predictions have been lose to actual demands.

Present uncertainties make forecasting articularly difficult, but Hydro expects the le of electric energy will increase, partic-larly in view of rising prices and possible hortages of fossil fuels.

On the question of generating reserves, ydro believes it should plan its future sys-m on the basis that its reliability (meaning ntinuity of supply) should be at least as igh as that of today's system.

The procedures and criteria used in lanning "reflect Ontario Hydro's judgment f the demands for reliability that its cus-mers have made."

Noting that the proportion of thermal enerating capacity is continuing to ncrease, Hydro said that "the relative nreliability of large thermal units will equire an increase in reserve generating apacity... up to 1982."

Hydro's criteria for determining genera-on reserves correspond to those used by ie Northeast Power Co-ordinating Coun-l, an organization composed of major lectric utility systems in Ontario, New ork State, New England and New Bruns-ick which co-ordinates planning and forts to promote maximum reliability and fficiency in interconnected power sys-ms. Evidence indicated that interconnec-ons, which are continually being rengthened, are important in providing ecurity of service.

A high degree of reliability is also quired in the transmission network to ovide uninterrupted power to customers. ie grid system must be designed to with-and "severe contingencies" such as orms and equipment breakdowns.

The Hydro submission says that "out-ges (power interruptions) of sufficiently ng duration can literally bring an econ-my to its knees....If an adequate and relia-le supply of electricity is not available, ing standards must inevitably decline id unemployment rise."

uel: Hydro prefers to go nuclear in the 170's and 1980's for several reasons and in view of the Pickering station's outstanding success. An ample supply of uranium is expected to be available in Ontario at relatively stable prices, while fossil fuels have to be imported. Another advantage: nuclear plants emit no combustion products into the air.

The current nuclear expansion program includes the proposed doubling of the Pickering and Bruce stations, and construction of a new station near Bowmanville to produce about 8,000 megawatts. In addition, a 2,000-megawatt oil-fired plant is proposed at Wesleyville, near Port Hope, and two 150-megawatt thermal units at Thunder Bay, preferably fuelled with Saskatchewan lignite.

Constraints on the nuclear program, however, include the supply of heavy water, some uncertainty about the future reliability of nuclear units despite Pickering's success, high capital costs, and the relatively long lead time required to build such plants. The Wesleyville plant is considered necessary to meet power demands in 1979, but a nuclear plant could not be built in the same time-span.

The alternatives to nuclear are coal and oil. Natural gas is burned at the Hearn plant in Toronto mainly for reasons of air quality, but availability of additonal supplies is limited. Coal is now being burned at five major stations, including the 4,000-megawatt Nanticoke station under construction on Lake Erie. To diversify Hydro's fuel mix, it is proposed to burn oil at Wesleyville and at the Lennox station, near Kingston.

Heavy water: Pickering-type reactors use heavy water as a moderator and heat-transport fluid. An 800-ton-a-year plant is in production at Bruce and a second plant of similar capacity is under construction.

Energy Minister Darcy McKeough has invited bids from private companies to build addtional heavy water production units.

Hydro's brief says the current program will require at least 3,200 tons a year expressly for Ontario Hydro.



Dr. R.H. Hay, of Kingston, closely follows evidence on behalf of the Ontario Municipal Electric Association at Energy Board hearings.

Environment: "Hydro is striving to minimize the effects of its operation on the environment," says Hydro's brief. "While society today is urging the conservation of energy, it seems clear that the demands for electricity will continue to rise as they have done for the past six decades.

"....Hydro will continue to emphasize research and development to ensure greater efficiencies in anti-pollution measures, the miniaturization of structures, the careful use of land and a high regard for esthetic considerations."

Marketing: Hydro has launched programs to communicate to the public the need for, and the benefits of, a wise (not wasteful) use of electricity, and to enable the public to make an intelligent choice in the use of energy without pressure of incentives.

Why rate increases? Although the proposed 1975 rate increases will be considered in detail starting in June, much of the evidence heard in the first two phases provides essential background for Hydro's application.

The effects of inflation can be seen in comparing the estimated cost of doubling

the size of the Pickering station. Construction of a second station at Pickering—essentially a duplicate of the existing four-unit plant, will cost $1,149 million compared with $746 million for Pickering A. However, Hydro will save approximately $70 million in terms of 1973 dollars by building on the same site.

The rising costs of wages and materials are also reflected in the price tag for the four-unit Wesleyville station, which will cost about $667 million compared with $440 million for the similar Lennox station. Wesleyville and Pickering costs would be even higher if they were newly designed stations.

"Most significant....is the dramatic increase in construction expenditures, with a corresponding increase in demand for funds to finance the expansion," said the Hydro submission.

Hydro's net borrowings are estimated at 3 per cent of annual total gross domestic savings as a result of the construction program approved in principle last year by the Ontario government but subject to review by the energy board and site hearings. This represents an increase from 2 per cent in borrowings projected by Task Force Hydro.

The high capital cost of nuclear vs. fossil-fuel units has a bearing because of Hydro's nuclear-intensive program. In the long run, though, nuclear plants have the advantage of low, relatively stable uranium prices while conventional thermal plants face escalating fuel costs.

Faced with the need to raise large amounts of capital, Hydro has taken steps to protect its good credit rating and maintain its financial soundness. (See Banking on Those Energy Billions, January-February issue).

As one measure to achieve this goal, Hydro introduced a system expansion charge in the wholesale cost of power this year to reduce borrowing and to raise additional revenue through rates.

Other views: The board heard sharply contrasting views on the accuracy of Hydro's load forecasts from the Ontario Municipal Electric Association, representing the province's 350 municipal utilities, and three other groups—the Niagara Basic Power Users Committee, the Sierra Club of Ontario, and Pollution Probe.

The OMEA contends that Hydro's forecast of power demands is "if anything", too conservative..." and believes such factors as improved efficiency in energy conversion, pollution control measures and reclamation of scrap materials will result in more use of electricity. As well, the price of electricity will approach, or even fall below, the price of other forms of energy, resulting in a shift toward the use of electric power.

On the question of reliability and security of electrical supply, the association's submission states: "The OMEA, whose members are always the first to feel the brunt of public reaction to any interruption of electrical supply, will resist by every available means any action or argument aimed at reducing the reliability and security of supply from Ontario Hydro."

The NBPUC, representing eight Niagara Region industries, criticizes Hydro's load forecasts and reserve margins as "highly questionable". "Numerous factors may work to suppress demands," says the brief, urging a "cautious approach to system expansion".

The Sierra Club expressed concern about the degree of reliability built into the Hydro system and whether it is higher than necessary. "We suspect it may be over-built, over-secure, over-reliable and over-costly," said the submission.

Pollution Probe criticized the conduct of the hearings and charged that Hydro's load forecasts are simply extrapolations of past electrical consumption patterns. It suggested that Hydro and the government should be taking conservation measures to reduce demand without adversely affecting the standard of living.

Hydro's financial policies were criticized in OMEA and Sierra Club briefs during the second phase of the hearings.

In a wide-ranging submission, the OMEA said financial policies and objectives enunciated by Hydro were "completely foreign to the municipal co-operative concept."

There are "several indications ... of a determination to reduce, if not destroy, Ontario Hydro's accountability to the municipal utilities and through them to the people of Ontario," said the brief. In particular, the OMEA criticized the omission from alternative financing plans of the specific debt retirement and system expansion charge approved by utility commissioners in a province-wide vote last year.

The Sierra Club urged "serious consideration be given to financing as much capital expansion as possible internally in the hope that the resultant rates will alert Ontario consumers to the massive growth taking place within Hydro."

The club also urged greater efforts to encourage conservation of electric energy and that more attention be paid to environmental and social costs.

The three phases of the hearings, covering the generation program, financial policies and the rate application itself, are expected to be completed in August. The board will then report to Energy Minister Darcy McKeough. If rate increases are approved, they will take effect January 1, 1975.

More than seven months of hearings are expected to go a long way in ensuring Hydro policies are subject to "critical and independent examination", and in guiding its future direction.

An opportunity to explain

Ontario Hydro's attitude toward the mandatory public review process was explained in its opening statement to the Ontario Energy Board on January 21.

"Ontario Hydro has been in existence for over 60 years," said the statement. "These 60 years have encompassed the most spectacular processes of change and industrial growth the world has experienced. During that time the functions of Hydro have grown to be extremely complex. They have never been fully explained to the public, or been subject to detailed independent public examination. It is not difficult to see that, as a result, there may

widespread lack of understanding of the
y in which Hydro goes about its busi-
ss.

"It is generally recognized that there is
eed to establish better communication
ween Hydro and the public. Hydro has
en increasingly involved in dialogue with
public through numerous public meet-
s and hearings.

"Hydro regards this series of hearings
ore this board as an opportunity to
plain to the public its policies and prac-
es, its plans and forecasts, and to have
se subjected, through the instrumental-
of this board, to critical and independ-
examination. Hydro hopes to benefit
m the comments and criticisms that will
erge from this forum and from the
ort of the board itself."

n conclusion, the 11-page statement
d "the program proposed by Hydro to
et the future electrical requirements of
ario is of great magnitude in terms of
nan effort, financial cost, and general
act on the economy of this province.

"There are, at this time, predictions of
h runaway inflation and of severe eco-
nic recession, due, in the opinion of
ne, to the energy crisis. There is no rea-
to believe that the turmoil of these
es will be of only short duration. The
et 20 years will face Hydro with chal-
ges equal to and perhaps surpassing
it has faced in the past." □



Report endorses commission concept

A blueprint for electrical distribution

Responsibility for the retailing of electricity should continue and expand at the municipal level, says the government committee report on the restructuring of public utilities.

A suggested blueprint for future electrical distribution in the province, the report sees "valid and compelling reasons" for the retention of the commission form of organization.

"In particular, the fact that the retail distribution of electrical energy in Ontario has the characteristics of a commercial enterprise, is self-supporting and free from the need to seek local tax support, sets this function apart from those duties normally assumed by municipal councils," the committee says.

"Moreover, the very significant and expanding share of Ontario's total energy requirements that are met through the retail distribution of electricity distinguishes this operation from other municipal services."

The report rejects the idea of a single provincial distribution agency. "There is no evidence that creation of this type of organization is either warranted or desirable. On the contrary, the preservation of local autonomy and customer responsiveness is best met through retention of individual municipal retail utilities."

The report—six months in the making and 131 pages in length—deals with the changing situation of utilities under regional government. Its recommendations spring from Task Force Hydro's examination of ways in which the distribution sect of Hydro might adapt to, and integrate wit new government structures.

The basis is that where there is a regional government, there will be a corr sponding retail electrical utility, or utilities operating within the same boundaries.

Whether a regional or upper-tier uti is established in preference to a number area or lower-tier utilities will depend upo local conditions. But at whatever level th utility is formed, "its policies and practice must reflect a sensitivity to local commu- nity needs and must also be capable of responding to overall social requirement as set forth in provincial policy objectives says the report.

"This implies that new municipal utiliti should be sufficiently similar in characte istics to enable them to relate to Ontario Hydro and other groups in a consistent manner."

"Area utilities should, in all probability provide the customer with better accessi bility to the authority," the report adds. "From the customer's point of view, area operation would appear least disruptive that it occasions minimum departure fro the status quo. Area operations necessa ily would be confined to a relatively narr financial base, incur greater re- establishment costs and inhibit the appli tion of uniform customer rates across th region."

On the other hand, the report sugge that regional utilities would operate from broader financial basis with greater capa ity to provide a high degree of technical competence and to cope effectively with the exponential growth in the use of elec tricity.

"In addition, the upper-tier structure would provide greater flexibility to deal with staff adjustments necessitated by reorganization. The desirability of estab lishing uniform customer rates and equi

service policies across a region favors gional organizations."

The report recommends that distribon of power continue under the commisn form of administration, but whether commissioners will be elected or ointed will depend on local studies. It suggests:

- that appointed commissioners be ned by the municipal council corresponding to the area or region within vich the commission operates.
- except for the head of council, mems of the first commission should be pointed from existing utility commissionprovided that as near equal representain as possible across the municipality is lained.
- the first commission will initially hold ice for at least two years, but not eeding the term of the council suceding that by which it was appointed. ore the expiration of the first term, the ncil will pass a by-law specifying ether subsequent commissions will be cted or appointed.
- Commissions will normally be comed of five members with options for a imum of three and a maximum of een, including the head of council or his egate. In no case will members of counform a majority on the commission.

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he report recommends that the retailorganization should own, operate, and ntain all retail service facilities of 50 kV under, but adds: "Preliminary studies e shown that in many instances this ctive can only be attained over a od of time. The harsh economics and nnical realities associated with the sude imposition of this common interface be prohibitive."

here will be circumstances where the onal authority will serve the customer directly and others where it will relinquish this right in favor of several municipal utilities within the region. In some cases, there may be a mixture of Ontario Hydro and area utilities operating within a regional structure.

Changes will also take place in the boundaries of Ontario Hydro's rural distribution system. In some cases, existing rural customers will become part of a municipal utility. In a few other circumstances, the opposite might occur.

In the event of employees being transferred from one utility to another, the committee recommends legislation to ensure a guaranteed period of employment and the protection of major benefits.

"The committee did not see that overstaffing would present a problem in any of the regions studied," says the report. "Economics of scale may be achieved in some instances permitting slight staff reductions over the long-term which will be achieved through normal attrition.

"It follows that staff now presently associated with the distribution facilities would be required in the new organization, although not necessarily in an identical capacity."

Predicting a growth in the financing of capital expansion through borrowed funds rather than from revenue, the report suggests the establishment of a central financing authority for municipal electric utilities similar in concept to a credit union. Utilities, Ontario Hydro included, would presumably invest surplus funds as well as borrow from this organization.

The report adds that the present system of obtaining borrowed funds through the municipal corporation or the regional council remains most appropriate, at least until a credit union-type of financing authority becomes feasible.

The committee also expressed "concern with a developing practice of some existing utilities to require a developer, builder or subdivider to contribute capital to the utility to cover the entire cost of the new electrical distribution facilities." It added: "This practice is highly discriminatory to the electrical customers occupying these homes."

In other sections, the report envisages greater uniformity of retail rates in both urban and rural areas, makes suggestions for the transfer of cost and sets out procedures for the implementation of its recommendations.

It suggests the formation of a central committee to initiate and co-ordinate all local rationalization studies. At their annual convention, OMEA delegates pressed for representatives on this committee and urged their associations to become "vitally involved in these decisions as soon as possible." □

Export import

by Bill Settatree



Transfers of power between interconnected utilities work both ways. It's nice to be in the black, but you never know when a split-second emergency will put you glaringly in the red

On January 14 at 10 a.m., staff at Ontario Hydro's system control centre in Toronto arranged for the export of 1,980 megawatts of electricity to the United States. That was almost enough to serve a million customers and was an all-time record sale for the utility.

In most respects, it was a routine day at the control centre and the operators were not particularly surprised that exports reached a new peak. After all, ever since the energy crisis began a few months earlier, Hydro had been called on more and more for assistance by neighboring utilities. The U.S. Power companies in New York State and Michigan were hard-pressed for oil to fire up their furnaces and combustion turbines.

Hydro's present dependable capacity is about 4,000 megawatts greater than its all-time peak load, allowing sufficient reserve to accommodate growing demand and permit regular maintenance on its equipment.

Power exports are not new to Ontario Hydro. The provincial utility has been interconnected with U.S. power companies since 1952 and these links have provided security of service during a number of system disturbances. In other words, if one system experienced a generation loss it could call on its neighbors for support until power was restored.

Since the first interconnection was established between Ontario and Michigan in 1952, the ties have been gradually expanded.

However, the need for close co-operation and strong links between utility systems became evident with the major northeast blackout of 1965, as a result of which utility systems in New York, New England and Canada formed the Northeast Power Co-ordinating Council.

The council now has a membership of 22 electric utilities, including seven investor-owned companies in New York and the power authority of that state, the municipally-owned system in Burlington, Vermont, the New Brunswick Electric Power Commission and Ontario Hydro, which is by far the biggest single member. H.A. Smith, Hydro's chief engineer, has been the council's vice-chairman for several years.



Sophisticated telemetering, computer and telephone equipment of the Michigan Power pool at Ann Arbor (left) and the New York Power control centre at Schenectady help operators to co-ordinate interconnections with Ontario.

Since its creation, the council has effectively worked to minimize the possibility of widespread power interruptions over its 300,000-square-mile service area. Together, its member utilities serve more than 37 million customers. Regional co-ordination of operations and planning is the essence of the council's work. NPCC members report continuously on their 10-year plans for the expansion of power stations and lines to meet new demands.

One of the most significant steps since the NPCC's formation was the establishment of master control centres for the New York Pool near Albany and for the New England systems at West Springfield, Mass. These new centres replace a number that existed previously and are linked directly or indirectly to Ontario Hydro's system control centre in Etobicoke, which has been in operation for many years. A fourth control centre is located in Ann Arbor, Michigan, and is operated by a power pool composed of Detroit Edison and Consumer Power Company.

The NPCC is also an active member of the National Electric Reliability Council, which represents all classes of utilities—federal, state, municipal, rural co-operative and investor-owned—throughout the U.S.

Control centres are linked throughout much of the United States in such a way that the nation-wide grid absorbs the shock of local power interruptions much like a gigantic net absorbs the impact of a heavy weight without breaking under the strain.

Two or more utilities may be interconnected without engaging in full co-ordination of their operation or development of new facilities. On the other hand, groups or "pools" of interconnected utilities may engage in an intensive co-ordinated program to increase their reliability and efficiency. Such is the case with the New York and Michigan pools.

Ontario Hydro operates on a one-system concept for maximum security and efficiency while maintaining interconnections with bordering provinces and states.

Connections with Michigan have also proved beneficial over the years, especially when the Ontario system was short of generation. This was particularly true in the late fifties and early sixties. In addition, long-term contracts to buy surplus power from Hydro-Quebec and Manitoba Hydro have saved Ontario Hydro millions of dollars that would otherwise have been spent

on additional generating facilities. Needless to say, the contracts have also helped Quebec and Manitoba justify the expense of their huge hydro-electric projects.

In recent years, power exports have played a more significant role in the interconnection arrangements with U.S. utility systems and in 1973 Hydro realized a profit of $31.7 million from sales to New York State and Michigan.

As the energy crisis deepened in the U.S., Ontario Hydro applied late last year to the National Energy Board for emergency extensions to increase its 1973 exports, and then later for changes in its export licence through to 1975. Both applications were granted.

The action was taken because by the beginning of September, Hydro's exports had almost reached the annual limit of nearly 4 billion kilowatt-hours permitted in its licence. At that time, appeals were received from the Michigan Power Pool and Niagara Mohawk for additional emergency power. The National Energy Board gave permission for the export of another 1-1/2 billion kilowatt-hours, which greatly reduced the risk of brown-outs in New York and Michigan.

Despite these exports, though, Hydro buys more electricity through its interconnections than it sells. Long-term contracts with Manitoba and Quebec accounted for nearly 10 billion kilowatt-hours last year.

Both Pollution Probe and the Consumers Association of Canada opposed the export licence application on the grounds that social costs of generating the electricity would outweigh the profits made by the sale. They argued that the additional consumption of U.S. coal in Hydro's power plants would pollute the Canadian environment to satisfy energy needs south of the border.

However, the National Energy Board decided that Pollution Probe's estimate of an $8.5 million social cost was not acceptable as a basis for rejecting the application.

It was based, the board said, on questionable data from the U.S. and did not consider other factors brought out by Ontario Hydro.

Hydro agreed that about 99 per cent of the electricity it exports to the U.S. is generated from U.S. coal. Indeed, coal units are started up specifically to meet export requirements.

Generating stations using U.S. coal account for 44 per cent of the total generating capacity in Ontario. One of the arguments to the NEB was that if the licence were denied, Hydro could find itself in a position where coal supplies vital to its own needs were diverted to U.S. utilities.

Bud Chandler, interconnections engineer, says sales to interconnected utilities doubled in 1972 and rose a further 40 per cent last year. He predicts 1974 sales will show a 45 per cent increase above 1973.

Ken Rusk, systems supervisor at Hydro's control centre, says recent export pressure began to grow during the heat wave of August and September, 1973. Shortages of installed capacity and equipment failures combined with the tremendous air-conditioning load to put a severe drain on U.S. utilities during what has traditionally been their time of peak load.

In previous years, Hydro would supply power to Michigan in the summer in exchange for equivalent power during the fall and winter, normally a lower-load period for the U.S.

But as fall approached, it became apparent that the Michigan utilities would face shortages due to the energy crisis. The winter of 1973 would not see significant surplus U.S. energy available to Ontario.

Mr. Rusk attributes part of the problem to the shortage of oil, which prevented utilities from using their combustion-turbine capacity to its fullest extent for peaking and base-load support.

By January, utilities in the New York City area were unable to supply their loads without support and reserves of light oil for combustion turbines were down to critical levels. "They have instituted 24 hours-a-day load reduction programs and are purchasing energy wherever possible to reduce the consumption of light oil," Mr. Rusk said at the time.

"As a result of these problems, Ontario Hydro has usually been providing maximum support to these utilities wherever possible. Often, the extent of this support has been limited to some degree by delivery problems to these areas rather than generating capability in Ontario," he added. The situation isn't getting any better. Keith Spencer, manager of the Michigan Power Pool's co-ordination centre at Ann Arbor, expects a continuing reliance on imports from Ontario for the next several years.

While the energy crisis certainly contributed to Michigan's problems last winter, Mr. Spencer is more inclined to blame shortages on difficulties of the Michigan utilities in getting new generating stations in operation over the past five or six years. These difficulties included delays brought about by environmental pressure groups, construction hang-ups such as labor disputes and material shortages as well as delays caused by the establishment of new approvals agencies.

These have now sorted themselves out but it will still be some time before we catch up," Mr. Spencer said.

It's not that the Michigan utilities don't have the generation available for peak situations, but rather that they have been reluctant to use precious oil and gas in

erators at Hydro's System Control Centre in etro Toronto, top left, keep tabs on power ws and discuss the situation with their U.S. unterparts while at right, Ken Rusk, power stem analyst, checks chart monitoring New rk link. Below, an operator at the Michigan wer pool keeps a close eye on the situation oss the border.





mbustion-turbine units because of an certain supply situation.

Mr. Spencer says more than 1,200 gawatts of combustion-turbine genera- in is available and can be pressed into vice within 10 minutes. Some of this uipment was installed after the 1965 ckout to provide the power necessary to rt up full-scale generators in the event y were ever again isolated from the ctrical system. Combustion turbine units also useful to relieve short-term power rtages, but are generally used sparingly cause of their high cost of operation.

On January 14—the day Ontario Hydro orded its all-time record export figure— Michigan power pool was in trouble.



Generating units throughout the state with a combined output of 4,573 megawatts were out of service. The combustion-turbines were pressed into operation in addition to increased purchases from Ontario Hydro.

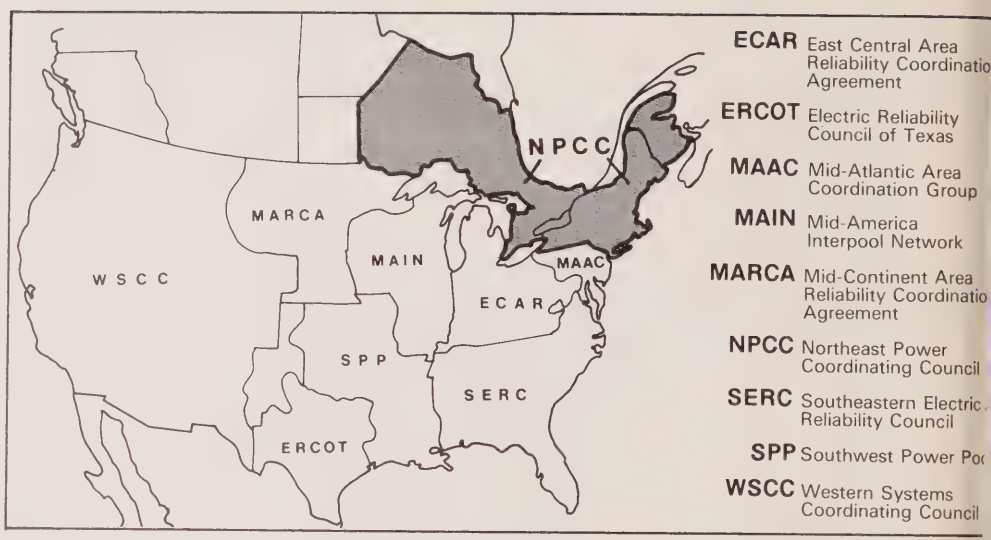
The following day, Hydro's exports were even higher, but they were not all sales. Involved was a rental arrangement whereby The Power Authority of the State of New York sent water from its side of the Niagara River through Hydro's turbines because of severe icing at the American plant—another example of an interconnection or pooling arrangement.

On January 20, it was Ontario's turn to experience severe icing conditions. Shortly after 8 p.m., a surge of current caused by line damage opened circuit breakers that isolated two units of the Pickering nuclear station and five at the coal-burning Lakeview plant. Half a million homes were plunged into darkness. To make up for losses in load, there was an instantaneous inflow over the interconnections from the continental grid.

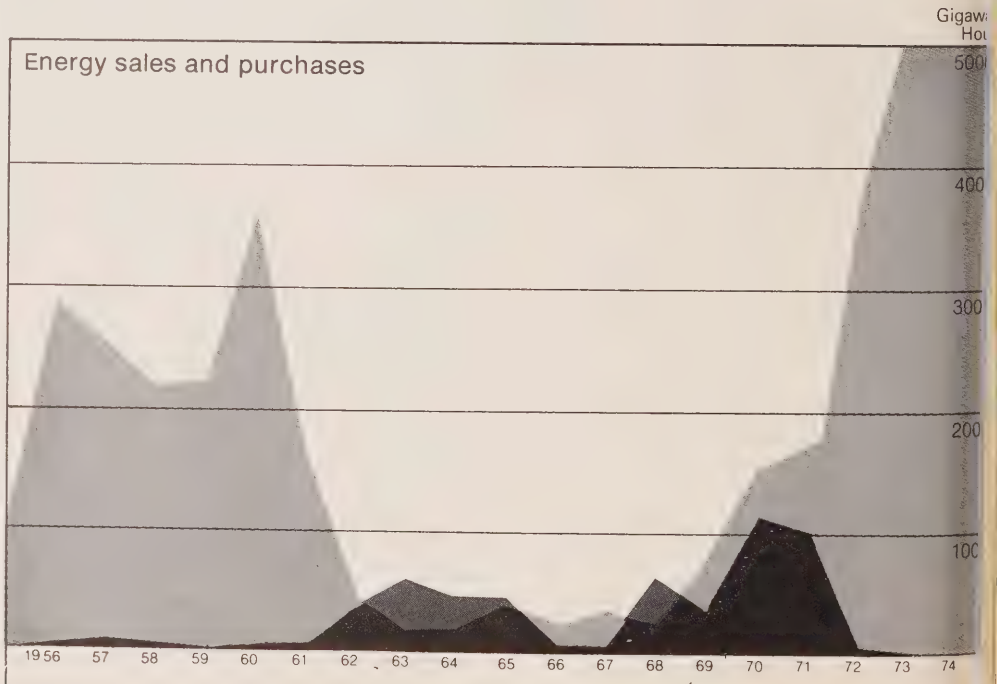
Within five minutes, Hydro had notified Michigan and New York that it would have to recall its exports and 1,000 megawatts of sale power was returned to the Ontario system to compensate for the loss of Pickering and Lakeview output. Exports were resumed several hours later after reserve generation and other available sources were tapped.

Hydro controllers say that had they not been exporting 1,000 megawatts at the time of the disturbance, the system's operating reserve could not have handled the emergency and a much more severe power interruption could have occurred.

In a submission to the Ontario Energy Board this year, outlining its proposed capital expansion program, Hydro referred to



Position of the NPCC relative to other interconnected systems.



Graph shows Ontario Hydro's power exports since the mid-1950's. Substantial exports occurred between 1955 and 1960. During the next eight years, the situation reversed itself. Water levels were so low that load reduction programs were considered and Hydro had to rely on imports of energy. Delays in the completion of Lakeview generating station complicated the situation. Exports took off again in 1969 and have continued to climb ever since. A combination of good water conditions, excess thermal reserve and the advent of nuclear power have helped Hydro to maintain its own requirements and have some in reserve for sales to Michigan and New York.

value of interconnections with U.S. utilis.

The submission noted that, in the past, nning has included possible dependce during extreme emergencies on the port of off-peak energy from the U.S. s policy is now being abandoned.

"The current uncertainties about future plies of fossil fuels leads us to believe t it would be imprudent, in planning generation for 1977 to 1982, to rely on emergency energy assistance from other utilities," the report said.

However, the report concluded by saying that the interconnections have in the past provided Hydro with economic and reliability benefits and should be expanded as long as the results continue to justify the costs.

Judging from the uncertain fuel situation in the United States and Ontario Hydro's relatively stable position, it appears that exports will continue to play an important role not only in producing revenue but in helping to maintain security of supply. □



n Spencer, manager of the Michigan contro re, expects a continued reliance on power hases from Hydro to help his state over the les in the next few years


R LAKES
SHIPPING LTD.

Mine's total output destined for Hydro

Ontario Hydro has entered into a 30-year contract for the entire output of a new coal mine to be opened in Pennsylvania by the United States Steel Corp.

During the term of the agreement, an estimated 90 million tons of coal will be shipped to Ontario, mainly to fuel the 4,000-MW Nanticoke generating station on Lake Erie. Deliveries will begin in late 1976, reaching the full yearly quota of three million tons in 1979. At that time, they will represent about one-sixth of Hydro's coal requirements.

"In view of our very large investment in conventional thermal stations and dependence on these, it is imperative that Ontario Hydro undertake long-range plans to ensure adequate supplies of coal to fuel them," says Hydro Chairman George Gathercole.

Ontario Hydro initiated discussions with U.S. Steel nearly four years ago. Studies determined that the Cumberland reserve in Greene County, Penn., offered advantages over other possible American sources in terms of quality, size, transportation, and cost.

The contract is part of Ontario Hydro's program to develop assured and economical fuel supplies for its coal-burning power stations. By 1980, even with the expanding nuclear program, coal plants will account for about one-third of Ontario's electrical resources.

Measured in British thermal units, Hydro's coal costs averaged 55 cents a million BTUs at the end of 1973. Average price per ton was $13. Coal from the U.S. Steel development will be slightly more expensive because of the cost of opening a new underground mine, and partly due to the low sulphur content, averaging 1.8 per cent. Current U.S. supplies of coal to Hydro average 2.4 per cent sulphur content.

The competitive position is expected to improve since the price is tied to production costs rather than market prices, which are vulnerable to scarcity and high demand.

An interesting feature of the U.S. Steel contract is the financial arrangement. Development of the new mine will require a capital investment of about $120 million for underground and surface facilities, 17 miles of railroad, and terminal equipment on the Monongahela River where the coal will be loaded on barges for shipment to the railhead. From there, it will move into the integrated train-ship logistical system developed in the 1960's to meet Hydro's coal requirements.

The bulk of the financing is being supplied in the U.S. About $70 million worth of mine equipment and machinery and railway rolling stock will be provided by a leveraged lease transaction arranged with U.S. Steel and New York financial institutions.

The contract gives Ontario Hydro full rights to the 90 million tons. Hydro will make an advance payment for coal of up to $38 million, which will be used for opening the mine. Leasing payments and Hydro's cash advance will be credited against the cost of coal.

U.S. Steel will also contribute to the capital cost of the development and will operate the mine.

Another part of Ontario Hydro's program is aimed at developing Western Canadian coal resources. Studies and tests are now being conducted to determine the type of coal suitable for burning in thermal stations and the companies capable of supplying it.

Plans are under way for a unit train transportation system, terminal facilities, and bulk lake carriers to move the coal east to power stations on the Great Lakes. Dock facilities will be required at Thunder Bay.

If shipments of a half million tons of Western coal to Ontario Hydro this year are a success, it is planned to increase purchases to some six million tons annually by 1980. □

Solandt urges top priority

It's the Parkway Belt!

While recommending that Ontario Hydro's 500,000-volt Nanticoke-to-Pickering transmission line follow the province's Parkway Belt wherever possible, Dr. Omond Solandt has urged that further delays in building the line be kept to a minimum.

In his final report, Dr. Solandt recommends that single-pole, improved-appearance towers be used along the entire route, except in a section between the new Middleport transformer station and Highway 401 through the Beverly Swamp, where lattice towers are recommended as a means of environmental protection.

Saying that the more than 20 months taken up by hearings of the commission and further public environmental studies have "already seriously delayed construction of the line," Dr. Solandt recommends that "hearings of necessity," required by the Expropriations Act, be waived in cases where property expropriation is necessary.

He says that hearings of the commission should be accepted as adequate public exposure of Hydro's plans and adequate justification of the need for the line.

In addition, Dr. Solandt recommends that any exemptions to the Planning and Development Act that will help speed up property acquisition, in the case of this transmission line, should be granted to Hydro.

Dr. Solandt says he is "convinced by Ontario Hydro's evidence that the time available for construction of the lines is dangerously short and there is a real possibility of substantial financial penalties and even power shortages if construction is further delayed."

Hydro pointed out in its submission to the one-man commission that units three and four at the 3,200-MW Bruce nuclear station are scheduled for service in 1977 and 1978. If the 500-kV line from the plant to the Toronto-Hamilton area is not available to deliver power from the station, there will be out-of-pocket expenses of $250,000 a week for one unit and $800,000 a week for the locked-in generation from the two units.

"These figures refer only to the direct cost to Ontario Hydro and do not include the loss to others due to umemployment and loss of profits if any demand cannot be met from other generating stations," Dr. Solandt pointed out.

Currently under consideration by the provincial Cabinet, the route recommended by the Solandt Commission would run north from Middleport transformer station on an existing Hydro-owned right-of-way to the north side of Highway 401. From there it would go east to a transformer station near Milton and continue eastward, passing south of Brampton and north of Toronto International Airport, to a point south of Markham.

The route Dr. Solandt proposed would follow the Parkway Belt between Milton and Markham and the last section—from Markham to Cherrywood transformer station, north of Pickering—would follow the yet-to-be-designated eastern section of the Parkway Belt.

EHV lines planned to bring power from the Bruce station into the provincial grid should connect with the Nanticoke-to-Pickering corridor just west of Milton, the report recommends.

The report also suggests that the Bruce line cross the Niagara Escarpment just west of the village of Limehouse. Dr. Solandt pointed out that almost everyone who has considered the problem of building a transmission line across the escarpment selected Limehouse as an area where a crossing can be made with relatively little environmental damage or social disturbance.

Dr. Solandt also agreed with a recommendation of environmental consultant Bruce Howlett that low-profile transformer stations using SF_6 switchgear be constructed where possible. The report further recommends the planting of tree screens as soon as the site for a transformer station is acquired, using well-developed vegetation to ensure rapid concealment.

"The use of SF_6 switchgear, bus bar and local transmission lines has made possible a revolutionary change in the total size and visibility of transformer and switching stations. Ontario Hydro has been in the forefront in pioneering the use of SF_6 switchgear and can be depended upon to make these stations models of what can be achieved with this new technology," Dr. Solandt added.

In his preface to the report, Dr. Solandt states in his conviction that the recommended route is better than earlier route proposals. He also believes that it will be more readily accepted by everyone, even those who will be adversely affected by it, because they know their views have been heard and considered.

If government approval for the routing is obtained soon, it's expected the line could be completed by 1977, two years after the original deadline.

"The studies have taken longer than we had hoped," Dr. Solandt says, "and Ontario Hydro is under great pressure. It is now up to the government to decide.

"Through these hearings, Ontario Hydro has dramatically improved its ability to communicate with the public and has improved its image," he adds. □



SOLANDT COMMISSION INQUIRY:

into the transmission of power from Nanticoke to Pickering

MAP 1

Niagara Escarpment Crossings

1 Highway 401
2 Limehouse
3 Rattlesnake Point

The Recommended Route – Diagramatic Alignment

A Toronto International Airport

Urban Areas

Parkway Belt Land Use Regulation Area
Ministry of Treasury Economics and Intergovernmental Affairs August, 1973

The Solandt Commission recommends that the Nanticoke-to-Pickering link of Ontario Hydro's 500 kv high voltage network follow the province's proposed Parkway Belt. The line will cross the Niagara Escarpment and run parallel to Highway 401, avoiding major urban centres. The Solandt report also recommends the use of improved appearance, single shaft towers, except where the line crosses the Beverly Swamp where guyed lattice-type towers are suggested.

Shifting standards socket to 'em

The multiplicity of standards for electrical equipment required by utilities across Canada is contributing to rising costs and supply shortages, according to a number of manufacturers.

Several examples were brought to light at the recent meeting of the Ontario Electrical League in Windsor. Thirty-nine different 100-amp meter sockets are required and there are more than 153 models on the market. Not only is the situation costly, it creates confusion for electrical contractors who must change their equipment whenever they move from one area to another. The message voiced at the conference was that utilities must strive for more uniformity in equipment ranging from the smallest meter sockets to major transformers.

"There's really just one way to get electricity into a house but the utilities, by adopting their own individual equipment requirements, have created 39 different ways of doing it," says OEL manager Bus Guy.

League President Jack Anderson, manager of Leamington PUC, agrees. He has raised the issue with the Association of Municipal Electrical Utilities (AMEU) which represents the management and senior staff of more than 350 municipal utilities in Ontario.

"It would appear sensible in this period of escalating prices and material shortages to standardize where possible," he said, adding that utilities in his area have achieved a degree of standardization through a combined marketing group.

Roy Hill, product manager of CEB Limited, says his company in Scarborough manufactures 12 different round-type meter sockets, 18 shallow square-type sockets and nine king-size sockets. The firm even had to produce one specific design or it would have been cut out of business in an entire province, he said.

"We're all concerned about keeping electricity costs down. I can discuss only the price of equipment," he said, suggesting that the production run was one area where costs could be reduced.

"Larger purchase quantities can result in lower material costs, but this has to be weighed against increasing inventory costs. Large-run costs also permit better tooling to be purchased, but the costs of tooling have to be written off before the equipment involved is outdated."

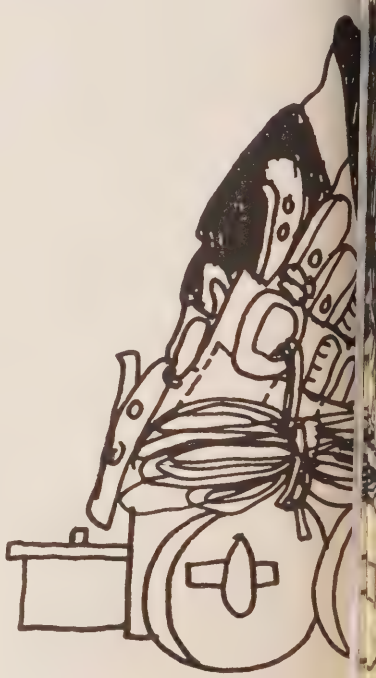
Mr. Hill says his company must manufacture 39 different 100-amp meter sockets even though all single-family residences in Canada have standard electrical service.

Len Hickman, sales manager for electrical products for Scepter Manufacturing Company, says his firm will not go into the manufacture of meter sockets because it would require just too many designs to make it economic.

"In the 100-amp, 300-volt meter socket, there are six different types, one designed especially for North York. We call it the North York Special," he said.

"Why should there not be a standard set, adhered to by all areas?" he asked. The manufacturers are not pinning their comparisons just on meter sockets, though. Mr. Hill says the widely varying specifications apply to such other equipment as service entrance panelboards, safety switches, and baseboard heaters (141 different models) to mention a few.

How did the wide variety of equipment requirements come about? Mr. Hill attributes the meter socket situation particularly



he period when utilities would buy the uipment themselves and supply it to the ntractor. Each utility set its standards cording to what it felt was best. Because ge volumes were being ordered, the nufacturer would go along with it.

"We were catering to the personal ims of the utilities," he said, noting that the utilities don't supply sockets anymore, but are still setting their own standards.

"They want to do it better than the next guy. However, they're not necessarily doing it better with their own design, just differently."

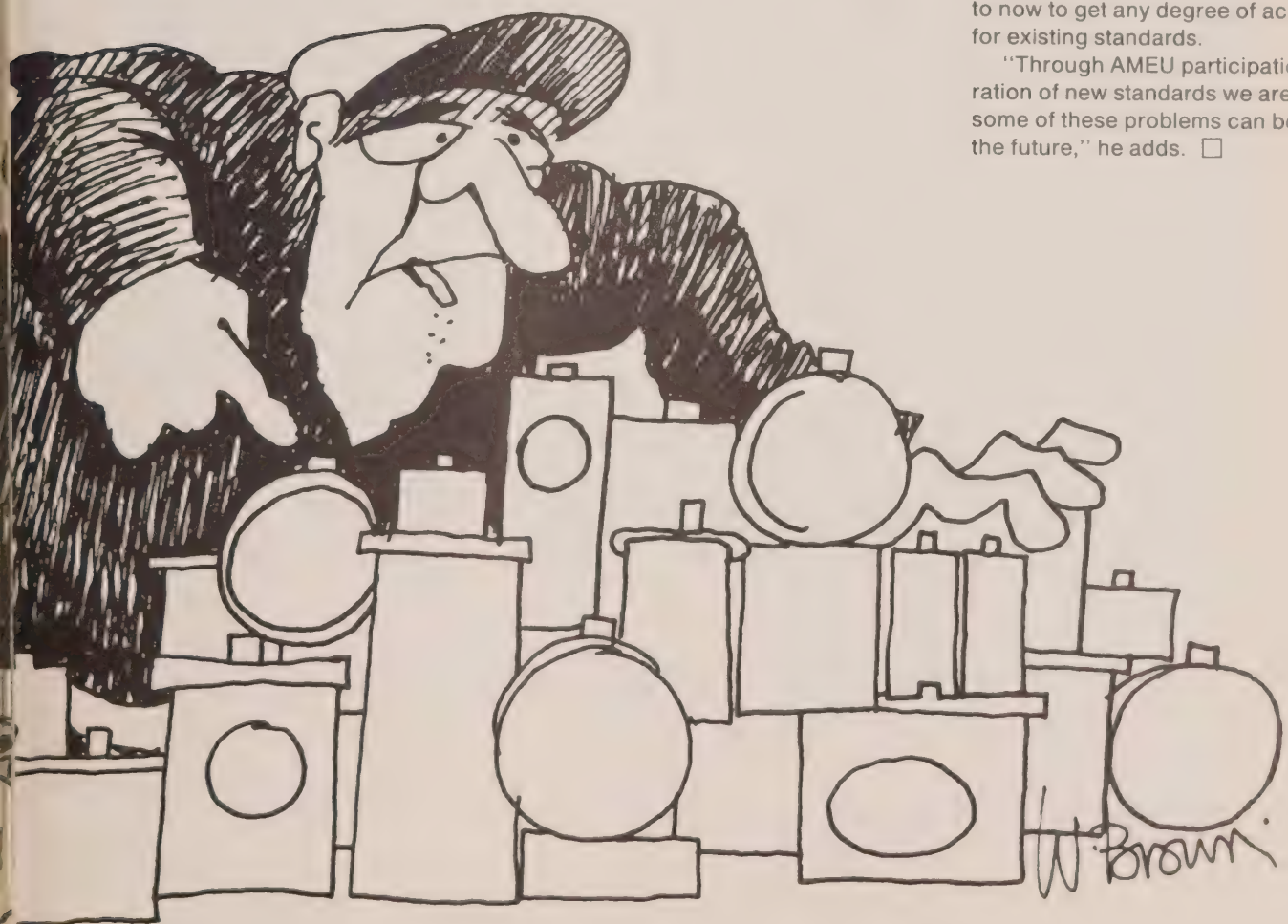
But help may be at hand—Bert Hopkins, spokesman for the AMEU, says uniformity of standards is not a new problem.

"We've had committees working on various aspects of it for years and I think we're making progress," he said. Mr. Hopkins says that two recent developments—a new proposal on underground distribution and changes in the Ontario Building Code—could narrow the number of meter sockets acceptable in Ontario to about three.

Mr. Hopkins also says that recent agreement has been obtained for one acceptable meter-mounting height throughout Ontario. Previously, 20 different heights were acceptable.

The AMEU will continue to pursue standardization among the municipal utilities. One area in which considerable work is now under way concerns transformers. Mr. Hopkins says it has been impossible up to now to get any degree of acceptability for existing standards.

"Through AMEU participation in preparation of new standards we are hopeful some of these problems can be resolved in the future," he adds. □



... EENIE, MEENIE, MINIE, MOE ...

GARBAGE?

It's a hot item these throwaway days

by Bob Morrow

Trials at Lakeview generating station will determine the feasibility of incinerating waste in a modern power plant... and getting a kilowatt bonus into the bargain

If Metro Toronto's garbage disposal battles were marked on a war map, red markers would appear at places like Harriston, Pickering, Port Hope and Vaughan Township.

The top of the map would look like a prairie grassfire as the result of one proposal to ship trainloads of Metro garbage to Northern Ontario, which was greeted by a chorus of nays.

Garbage dumping produces intense political heat, particularly if it's someone else's rubbish. But, ironically, the actual heat value of garbage is the reason why the "Watts from Waste" plan—an experimental project to turn garbage into electric power—makes good sense. At present, energy is its most valuable component.

Initially, shredded refuse will be burned at a rate of 500 tons a day in a 300-megawatt unit at Lakeview generating station, just west of Metro. Starting in 1976 or 1977, garbage will replace about 10 per cent of the coal consumed by the unit.

If the two-year trial project proves successful, three of the eight Lakeview furnaces could consume about 200,000 tons a year of refuse prepared from 248,000 tons of raw solid waste. Around 1980 this would be about 10 per cent of Metro Toronto's garbage, which now amounts to about 1.4 million tons a year.

This supplementary fuel would be equivalent in heating value to 68,000 tons of coal worth nearly $1 million at current prices. With fuel prices escalating at an expected rate of 5 per cent a year, the same quantity of coal would be worth $1.7 million in 1985.

Economic studies indicate that "Watts from Waste" costs will be higher than those for existing landfill operations, but eventually they may become cheaper than landfill—if disposal sites can be found—or incineration. As fuel costs rise the scales tip in favor of using prepared refuse to generate power.

The $15 million project, which includes construction by Metro Toronto of a fuel preparation and recycling plant in Etobicoke and conversion of the Lakeview unit, is a frontal attack on the mountainous debris of a throwaway society. Another approach to garbage disposal was recently proposed by the City of Toronto. Under this plan, about 75 per cent of the city's garbage would be used as fuel to provide steam heating for downtown buildings at a cost of $58.5 million. A new steam plant would be built to consume approximately 25 per cent of Metro Toronto's waste.

Solid waste management presents a nest of thorny problems to policy-makers these days. Rising costs of garbage disposal are pushing up municipal taxes. Landfill sites are scarce, expensive or remote for economic trucking. And dumping, open burning and incineration are becoming less acceptable to a public aroused about pollution and environmental blight.

While garbage dumping runs into stiff public opposition, the "Watts from Waste" concept is expected to score points for several reasons: public acceptance of the need for recycling materials, reduction of the volume of wastes, substitution of garbage for imported coal at Lakeview, and an established market for electric energy.

Initial plans call for separation of only ferrous metals for possible re-use by industry and perhaps bundled newspapers and cardboard. But the project provides a means of recovering other materials now discarded as waste, such as aluminum, copper and other non-ferrous metals along with crushed glass—and recycling them if markets can be developed.

Rising fuel prices and possible energy shortages, triggered by the 1973 Middle East war, make the project even more attractive. "The Arabs have helped the concept of using garbage as fuel a lot," says Wes James, an Ontario Hydro member of the "Watts from Waste" study team.

The team, appointed in May 1973 by former Environment Minister James Auld, was chaired by the former Toronto alderman Tony O'Donohue. Other members, besides Mr. James, were from Metro Toronto, the Town of Mississauga, and the Ministry of the Environment.

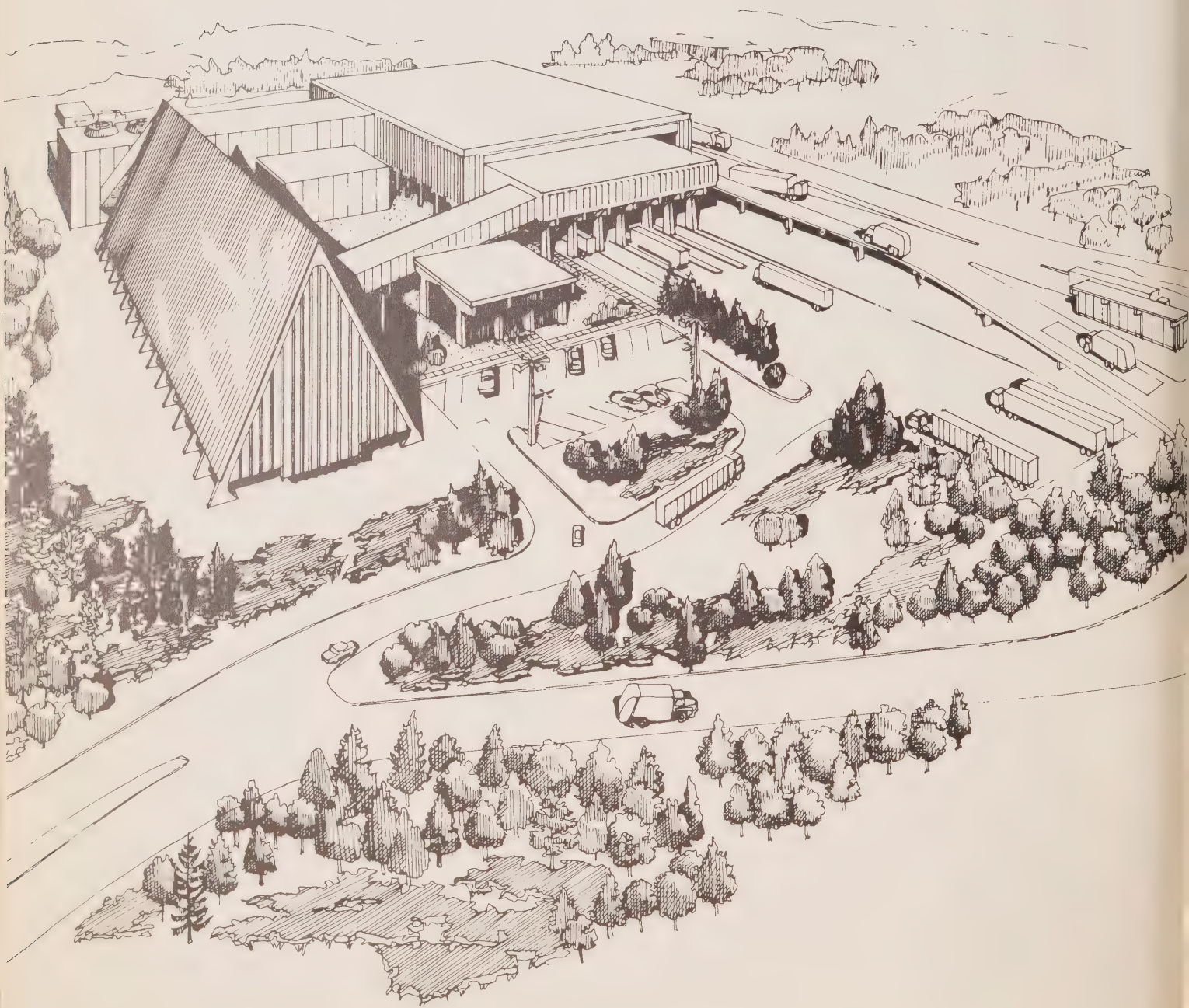
The team examined the feasibility of burning specially-prepared refuse in generating stations and visited a smaller prototype project at the Union Electric Company plant in St. Louis. They also had discussions with manufacturers of bottles and metal containers on the recycling of non-combustible waste at the separation plant. Subsequently, a detailed report, including an evaluation of the impact on air pollution, was prepared for the environmental ministry by Horner and Shifrin, Inc., consulting engineers on the St. Louis project.

As a result, Mr. Auld announced that a grant of $3-1/2 million will be made to Ontario Hydro to modify a Lakeview unit. The province will also contribute $1-1/2 million to Metro Toronto, which will build and operate the $11-1/2 million processing plant.

"While some unknowns and possible problems could arise in the program", said Mr. Auld, "we are confident that at the end of the two-year demonstration period we will have the capability of economically converting a significant portion of solid waste to fuel, and of economically recover-



Proposed $11.5 million Metro Toronto plant will turn raw garbage into prepared refuse to generate electricity on a test basis in one of Lakeview generating station's eight units. Large hammermills will shred garbage into small pieces and ferrous metals will be separated magnetically. An air chamber will separate light, burnable waste from other heavy materials. Prepared refuse will be stored temporarily in A-shaped building at left, then shipped to Lakeview in self-unloading transport trucks.



certain components of solid waste for
ycling and use by industry".
Hydro Chairman George Gathercole
s that the Lakeview project is not a
all experimental operation. "The Lake-
w unit is one of the largest, if not the
gest, ever employed in this type of oper-
on."
The Metro processing plant will be
ated on a completed landfill site in Eto-
oke, about 10 miles from Lakeview.
sent plans call for operating the plant
hours a day, five days a week, to proc-
625 tons a day during the demonstra-
n phase. If the demonstration proves the
ject feasible, the capacity would be
ubled. Two processing lines would
ure continuous throughput of waste.
Garbage will be delivered to the upper
or of the processing plant by municipal
bage trucks and large transfer trailers.
hicles will dump their loads and front
l loaders will push the garbage onto
e conveyors which will feed large ham-
mills.
The hammermills will shred the garbage
pieces no larger than 1-1/2 inches.
rous metal, including steel cans, will be
arated magnetically. Then the waste
be passed through a chamber in which
ast of air will separate the light, fluffy
nable material from non-ferrous metal,
ss, wood, and heavy particles of dense
stics, rubber and leather. The light frac-
is expected to be 75 to 80 per cent of
total solid waste coming from the mills.
Conveyors will then carry the prepared
se to a storage building, and self-
ading transport trucks, each carrying
ut 20 tons, will move it to Lakeview.
he trucks will unload into a large con-
e receiving hopper at the station and
veyors will carry the prepared refuse to
e bins. Fed through a chute into an air-
feeder, the garbage will be blown
ugh pipes into the fireball of the fur-
e. One boiler is expected to consume
ons an hour of refuse in addition to 90
of coal when operating at full load.
he Lakeview test unit is equipped with
40-foot stack and electrostatic precipi-
s to remove fly ash. Because refuse
a higher ash content than coal, there

Trimming our wasteline

New wrinkles in collecting and disposing of garbage and in recycling wastes are appearing every day. Here is a Hydro News sampler:

A vacuum pipeline, pioneered in Sweden, whisks garbage underground at 20 miles an hour from apartment buildings, hospitals and amusement parks to remote collection and transfer sites.

• • •

Metro Toronto plans to spend $750,000 to build a ski hill and ski facilities on a Scarborough landfill site.

• • •

Some municipalities are using transfer stations to shift refuse from smaller collection trucks to larger vehicles for more efficient long-distance hauling.

• • •

In Houston, Texas, a special garbage truck with a crane-like arm picks up bagged garbage from front lawns.

• • •

Reynolds Metals Co. has built a "recycled house" valued at $60,750 in suburban Richmond, Va. Among materials used were aluminum scrap for framing; crushed glass for brick, concrete block, and driveway; recycled newspaper for subflooring, paneling, and roof deck; and fly ash for filling concrete. The house also contains bathroom fixtures made of quarry tailings, insulation composed of furnace slag, and sawdust and woodscrap kitchen cabinets. Recycled garbage is used for yard compost.

• • •

W.L. Crentz, assistant director for energy at the U.S. Bureau of Mines, says if all cattle manure, urban, and agricultural wastes were converted to fuel oil, the available energy would equal 200 million tons of coal or two-thirds of the coal now used to generate electricity in the U.S. At a Winnipeg conference called to discuss conversion of agricultural wastes into energy, he described three methods of deriving oil or gas from organic wastes. □

will be a significant addition to Lakeview's ash disposal problem, although the precipitators are expected to be able to handle the extra load. On the other side of the coin, Metro's older incinerators are being phased out because of air pollution regulations and difficulties in installing air cleaning equipment.

"At present, energy is the most valuable part of the garbage," said Mr. James.

The prepared refuse fuel is expected to have a heating value of about 5,000 BTUs per pound, depending on moisture content. Hydro has agreed to pay for the substitute fuel on the basis of the heat recoverable from it, less operating costs directly connected with burning garbage. "These operating costs can be substantial," said Mr. James, "and one of the objectives of the demonstration is to establish these costs so that we can fairly assess the delivered value of the refuse fuel."

Hydro considers only three of its Toronto area boilers suitable for burning refuse, and each of these has a current replacement value of not less than about $10 million. The two-year demonstration period will be used to determine whether burning refuse fuel causes unacceptable boiler corrosion or other problems, and to monitor air pollution.

For test purposes, new sections of boiler tubing will be installed and air-cooled probes will be inserted to check the effects of combustion on new tubes and on metals of various composition. Garbage will be analyzed daily so that potential problems can be anticipated.

Reliable operation of the test unit will be an important consideration. "An outage on a boiler means the loss of a 300-megawatt generating unit to the system," says John Korzekwa, manager of central thermal services. "At a time when the generation supply is critical, it may even mean power cuts to the customer."

Each ton of raw solid waste contains an estimated 50 cents worth of ferrous metal for which there is a possible market, but the recovery of other materials is a matter of economics, says the Horner & Shifrin report. These materials, including crushed glass and non-ferrous metals that cannot be separated magnetically, will be dumped as landfill unless markets can be found.

Recycling of steel cans poses a problem because they become contaminated with other wastes. However, there is some optimism that an acceptable product can be produced for re-use. Another possibility is that aluminum foil pouches, now being test marketed across Canada, will replace many cans and glass jars as containers for juices and other foods.

The case for recycling has been stated succinctly by a University of New York economics professor in a recent issue of Environmental Affairs. "For political and economic reasons, recycling will soon become an increasingly important phase of economic activity," said Eric Carlsen. "It represents the solution to both the problems of increasing solid waste with its attendant insatiable demands on land and those associated with the growing scarcity of natural resources."

But three separate analyses of Metro garbage, taken at different times, put recycling possibilities into perspective. The combustible material ranges between 83 and 86 per cent. This portion, which varies greatly with the season of the year, includes paper, cardboard, food and garden wastes, plastics, rubber, leather, rags and wood. Non-combustibles include glass, which ranges between 5 and 9 per cent, and metals, 4.4 to 6 per cent.

The Watts from Waste study team discussed possible recycling of crushed glass with the glass industry. The problem is that brown, green and white glass will be turned into a homogenous mixture and techniques for color-sorting of glass on a large scale haven't been perfected. However, there are possibilities that mixed glass could substitute for part of the aggregate used in asphaltic concrete for street paving or in the manufacture of glass wool for insulation.

Non-ferrous metals such as aluminum, copper and zinc comprise a small percentage of solid waste but their value is relatively high. Whether it's economic to recover them, however, is still an open question.

Horner & Shifrin suggest that attention be paid to developing long-term markets for metal and glass. "The development of such markets can be expected to be gradual, and may take some time to achieve stability," says the report. "The prices to be anticipated for the materials recovered can only be estimated at this time. Such prices can be expected to fluctuate, depending upon the availability of recovered materials, of competitive materials, and the demand for them."

Although the Lakeview project will reduce the volume of waste, the quantity of garbage is growing to staggering amounts. "The output of refuse, both domestic and industrial, has increased at an alarming rate and is presently at 4-1/2 pounds per person per day," says Tony O'Donohue. "If present trends continue, this figure will be about nine pounds by the end of the century."

By 1986, Metro Toronto and the surrounding area are expected to generate 3,000,000 tons a year and continued landfill operations will be necessary.

"If Metro Toronto could not use landfill sites, people would have garbage on their front lawns," said Metro Chairman Paul Godfrey in a service club speech. Within three days the Canadian National Exhibition football field would be filled with waste right up to the roof.

Because of the dimensions of the Metro disposal problem, several landfill plans are under consideration. CP Rail has applied to develop a landfill site near Port Hope to handle 450,000 tons of Metro garbage yearly and a private company is seeking permission to dump millions of tons of garbage into 913 acres of gravel pits near Maple.

Another proposal, which involves some recycling, has been made by Lake Ontario Cement Ltd. to the federal and provincial governments. The plan involves use of shredded municipal garbage as a fuel source for making cement. The residual

Potter's parks

n would be incorporated into the fin-ed product.

Several recycling proposals are also der consideration in Metro, but the tts from Waste plan is the closest to frui-n. The project has been approved in nciple by Metro Toronto and Etobicoke uncils.

The experimental nature of recycling is icated by the fact that the U.S. federal vernment is financing several pilot pro-ts. One of the spinoffs of this research is ophisticated technological process own as pyrolysis.

Pyrolysis turns wood into charcoal and al into coke by applying high tempera-es in the absence of oxygen. New pyro-c processes are being developed which uld convert solid wastes into low-grade l oil or heating gas. The great advan-e of such fuels, compared to burning edded refuse, is that these fuels can be ed, stored and burned without the addi-n of fossil fuels like coal.

Another futuristic concept, which ges on the distant and uncertain devel-ment of controlled thermonuclear ion, involves using a "fusion torch" to rid of wastes. As described in the Time-'s 1974 Nature/Science yearbook:

"It would blast the waste material back o its constituent atoms—oxygen, car-n, hydrogen, iron, copper and so on. e basic elements recovered in this way uld then be sold, while the energy eased would be sufficient to light and at entire cities."

A sense of urgency, however, militates ainst far-out solutions. There is a grow-in consensus among environmental and nsumer groups that the waste disposal blem should be attacked head-on by ducing the amounts of packaging materi-a. A recent move in this direction has en taken by a supermarket chain which offering to pay customers to return plas-ti and brown paper bags.

Mr. Auld says the province has a defi-ne commitment and financial interest in holding the line on the increase in the amount of garbage generated. "Strong leadership will be taken in this field so that we will cut down as much as possible on one-way disposal cartons. That will include tin cans, bottles, plastic containers. You name it."

Reduction in packaging and paper baggery would certainly help, but it's likely that a multi-faceted, systems approach will have to be taken to handle solid wastes. Experts suggest such elements as consumer education, more efficient collection techniques, a growing amount of recycling, strict regulation of sanitary landfill projects, steam production for district heating or electricity production where feasible, and perhaps in time more sophisticated processes. Rising costs and material shortages will certainly provide strong incentives for innovation and conservation of resources.

It may be a long, slow process that won't satisfy the impatient, but we're learning to turn the social nuisance of garbage into a profitable asset. □



Tom Potter, supervisor of the Beare Road landfill area in Metro Toronto, keeps sharp eye on future parkland.

No wonder Tom Potter's eyes flash in anger when people call his landfill operation a garbage dump. Actually, he creates parkland.

The landscaping ingredients are garbage, soil, leaf mold, sewage sludge; grass seed, and attention to environmental details. In his 16 years with the Metro Toronto works department, Tom has left a string of parks as a legacy.

Tom Potter supervises the 200-acre Beare Road landfill area, largest of two located in Metro Toronto. During a recent week 700 to 800 vehicles trucked about 23,000 tons of garbage to the Scarborough site, twice as much as last year's average weekly tonnage.

But any resemblance to a garbage dump ends at the landscaped entrance. Trucks loaded with up to 20 tons of waste stop at a weigh station flanked by a grassy knoll studded with young saplings.

The trucks dump their loads into "cells" that are, in effect, man-made valleys sculpted by earth-moving equipment. Bulldozers spread the refuse and cover it each night with nine inches of soil. When filled up, the "cell" is covered with four feet of soil.

The landfill area is tiled to carry rainwater seeping through the waste to a

Trucks carrying up to 20 tons of garbage wind up road at landfill site. Soon the site will be buried under about a foot of soil.

284,000-gallon lagoon. From here, liquid is pumped uphill to a secondary lagoon to repercolate through the landfill. The newly-created terrain is graded to carry runoff toward the lagoon, which is concealed at the base of a man-made grassy hill.

Perimeter ditches direct runoff water from the surrounding terrain into the Little Rouge River nearby.

To reduce dust, roads are oiled. Spraying keeps insects under control, and earth berms screen operations from Finch Avenue residences.

Leaves collected from Metro streets are chopped up and mixed with sewage sludge—a good garden fertilizer offered free of charge to the public. It's also used to topdress the landfill area before sowing grass seed.

Several years will elapse before the Beare Road site is filled up but, in the meantime, preliminary grading has already begun to create ski hills suitable for both adults and tots. Trucks now travel along a 100-foot-high ridge built of covered, compacted garbage.

Tom Potter speaks with pride of driving past former landfill sites that are now parks. His first project was Marie Curtis park in Etobicoke; another is the site of York stadium. "Hardly anyone knows they used to be landfill areas," he grinned, "but I do."

When the Beare Road site opened in 1967, Tom found a swampy, hilly wasteland. Now, seated behind the wheel of a pickup truck, he watches the bulldozers bury heaps of refuse while on his right the blue waters of Lake Ontario stretch to the horizon.

But, in his mind's eye, he already sees another park. □





sidual for Wesleyville

idual oil will be the principal fuel for the posed Wesleyville generating station on Lake Ontario shoreline, six miles west Port Hope.

When Ontario Hydro first announced ns to build the 2,000-MW plant, it said station would be fuelled with crude oil. wever, the choice of fuel was reas- sed in the light of last year's oil crisis. six-month study, which examined all rnatives from coal to nuclear, recom- nded the use of residual oil.

Residual oil is what remains after other rochemicals like heating oil and gaso- have been removed from crude. Its use stricted to large industrial users since difficult to handle and requires special- equipment.

Construction of the four-unit Wesleyville nt is due to get under way this year with rk on an access road. Site preparation start next spring.

Two of the plant's 500-MW units are eduled for service in 1979 with the two aining ones due the following year. It's ected that a supply of at least 15,000 rels of residual oil a day can be ained on a long-term basis.

As an economy measure, the station will standardized by using plans prepared the oil-fired Lennox generating station, er construction on Lake Ontario at h. Lennox is due to produce first power t year.

lity historian

at does an Ontario municipal utility nager do in retirement?

B. M. (Barney) Graham found one way pend his first year after stepping down eneral manager of North Bay Hydro— writing a book.

Mr. Graham's work, "North Bay Hro—1885-1972", traces the history and development of electrical service in Canada's second largest city, geographically speaking, from its inception until he retired.

The 160-page, hard-cover volume should provide an excellent reference source for people interested in the history of the North Bay area and sells for $5 at the bookstands. Complimentary copies have been given to librarians, schools, the news media, and people mentioned in the book.

Conservation stressed



W. Darcy McKeough

Just back from Britain where he and federal government representatives discussed nuclear power proposals with energy officials there, Darcy McKeough, Ontario's Minister of Energy, faces the television and press at Windsor. Mr. McKeough was addressing the Electric Week luncheon held in conjunction with the Ontario Electrical League's annual meeting.

Theme of this year's conference was "Wise Energy Management" and Mr. McKeough joined others in stressing the need for conservation while at the same time emphasizing that Ontario does not have an electric energy shortage.

Mr. McKeough also re-emphasized the government's position that private industry should become involved in the province's nuclear program.

The OEL meeting was attended by about 350 people, including Hydro and municipal utility representatives, contractors, manufacturers and distributors. Panel discussions on insulation, inspection, and standards delved into a variety of problems confronting the industry. (See feature on meter sockets in this issue)

Jack Anderson, manager of Leamington PUC, was re-elected president and George Russell, of Canadian General Electric, was returned as vice-president. Directors are: Cyril Smith, of Guelph, representing the OMEA; George Whelan, CEB Ltd., and Gord Marshall, Canadian Chromalox, representing the Canadian Electrical Manufacturers Association; Dick McVeety, Perth, representing the general membership, and Gary Pepper, Ontario Hydro.

500 megs more



Nanticoke turbine takes shape

Ontario Hydro has added another 500 MW to the system with the coming on line of the fourth unit at the 4,000-MW coal-fired Nanticoke generating station on Lake Erie, eight miles east of Port Dover.

The unit was linked to the system in mid-March and output was increased in 50-MW stages until it reached full output.

The plant's first three units went into service last year. First power from the fifth unit is expected next February with the remaining three coming on line at 10-month intervals after that.

Four in a row



EUSA president M.H. Kelly presents shield to Owen Sound PUC commissioner Bob Rutherford.

Owen Sound PUC crews have made it four straight.

When Commissioner Bob Rutherford was called to the podium at the annual OMEA-AMEU convention to accept the Electrical Utilities Safety Association award for having the lowest accident frequency in its category (15,000 to 60,000 man-hours), it marked the fourth year in a row that Owen Sound has picked up the safety shield. In fact, the utility worked the entire year without a single accident.

Other winners were Deep River Hydro, 0-15,000 man-hours; Niagara Falls Hydro, a repeat winner in the 60,000-250,000 man-hours category, and Sudbury Hydro for the 250,000 and over accident-free man-hours class.

Mediator joins staff

K.M. (Kevin) Burkett, the Ontario Department of Labour conciliation officer involved as a mediator in the Ontario Hydro-CUPE Local 1000 dispute prior to the 1972 strike, has joined Hydro as senior industrial labor relations officer.

Before his appointment as mediator, Mr. Burkett served three years as a conciliation officer. He was previously research director and negotiator with the Civil Service Association of Ontario.

Mr. Burkett received his masters degree in business administration from the University of Toronto in 1968.

And on that farm ...

Old MacDonald would have been proud had he seen the Iowa Public Service Company's newest generating station. It's, well, a sort of farm.

The utility has disguised a $13 million combustion-turbine installation as a farm at a site near Waterloo, Iowa.

To conform with its surroundings, the maintenance building will look like a red-and-white barn with cooling water being stored in a silo.

A white fence and landscaping complete the decor.

Interest soars

Interest in electric heat is soaring because of the concern over future oil prices, say spokesmen for both Kitchener PUC and Waterloo Hydro.

Gerry Knorr, sales supervisor in Waterloo, says he gets several calls a day from homeowners or builders considering changing furnaces to electric heat. And Bill March, Kitchener PUC sales representative, says inquiries about full or partial electric heating are being made at twice the rate of last year.

Waterloo Hydro estimates electric heating is being installed in about 20 per cent of new homes and Kitchener estimates its share of the new-home heating market at more than 10 per cent.

In fact, the tallest office building in Waterloo, Marsland Centre, is all-electric. Two of the 13 floors are occupied by the city administration.

Eight hundred special windows reduce heat and glare but allow natural sunlight t filter through. Double-glazing forms one the insulation components.

Built two years ago, Marsland Centre was the first building of its size in Waterlo to be heated and cooled entirely by electricity. The system makes effective use o power by re-using heat given off within th building from transformers, motors, lighting and business machines. Heated air is collected, cleaned and recirculated.

Sound of silence



Savant Lake at night

The 240 residents of Savant Lake, a ham about 160 miles north of Thunder Bay, c now sleep nights without worrying ... abo the sound of silence.

Until a few months ago, silence in the middle of the night would awaken many the community's populace. It meant the thudding diesel generators—only sourc of power at Savant—had broken down.

Maintenance men would struggle out bed and into the freezing night to make repairs and get the reassuring thud echo ing over the hamlet once again.

But that's all changed now. Power frc the Ontario Hydro grid is being fed into Savant Lake over a 50-mile wood-pole li silencing the diesel generators once an for all.

An official opening commemorating t arrival of the line was attended by the ha let's entire adult population. They cheer

husiastically when Ontario Hydro Chair-
n George Gathercole and Ontario's Min-
r of Natural Resources Leo Bernier
shed a button to illuminate a panel and
icially start the flow of power over the
. And they danced until dawn in the
ghtly lit community hall.

Among the visitors who flew to the small
thern community for the ceremony
re federal and provincial members of
rliament for Thunder Bay and D. Arthur
ans, a member of the Hydro board.

ipped, but ran well



Jim Patterson

Nineteen-year-old Jim Patterson, a student a Governor Simcoe High School in St. Catharines, almost never made it to the finals of the Ontario Oral Communications Festival in Toronto.

Jim slipped and sprained his ankle while running for the bus to Toronto. But he did show up and made a fine showing, limping to stage between ice-pack treatments to take second place in the secondary school impromptu speech section.

And for Emily Chilingarian, a grade 13 student at Guelph Centennial CVI, perseverance also paid off. Making her sixth attempt in the provincial finals, she topped the secondary school prepared speech section with her talk on the energy crisis.

Emily, 18, placed third in the same section last year.

Sixteen-year-old Tom Lynch, of Lindsay's I.E. Weldon Secondary School, topped the difficult impromptu speech section. His mother said later that Tom has six brothers and "just had to learn to speak up."

Naomi Flavin, 13, of Toronto's Blessed Sacrament School, took top prize for the elementary school division.

Other winners were: John Lund, 12, of Ashbury College, Ottawa, second in the elementary section with Emily Wong, 13, of Glenhaven Senior Public School, Mississauga, third; Julia Shea, 15, second in the prepared speech competition and Brad Milne, 15, of Grantham High School, St. Catharines, third; Shawn Brayman, 17, North Grenville District High School, Kemptville, third in the impromptu speech class.

The annual contest, now nearly 50 years old, is jointly sponsored by the Ontario Public School Trustees' Association and Ontario Hydro. The 36 students taking part in the provincial finals were winners in their respective districts and zones and represented close to 400,000 eligible contestants across Ontario. They ranged in age from 12 to 19 years.

Subjects varied from "The Haggis," to "Story Times, Nursery Rhymes and All That Violence." Two teen-aged girls were strongly in favor of Women's Lib.

Research aid

The federal government has pledged more money and research to step up development of electric power across Canada.

Energy Minister Donald Macdonald says Ottawa will provide money for studies on interconnections of provincial utilities which could lead to the establishment of a national power grid.

He added that Canada has to increase its dependence upon nuclear power as fossil-fuel stocks are depleted.

"We are moving toward an electrical society which will be heavily dependent upon nuclear fuels and new forms of generation," Mr. Macdonald said at a federal-provincial energy conference in Ottawa.

"Our energy policies should reflect these facts and our research and development activities should be tailored to ensure best use of our skilled professionals as well as this nation's resource base."

Mr. Macdonald announced new guidelines to safeguard uranium supplies and promised funds to provinces initiating their own programs of nuclear power development.

Ottawa will provide 50 per cent of the costs of the first nuclear unit in any province and 50 per cent more for a second unit if that power is meant to serve more than one province on a regional basis.

The federal government will also foot half the bill for studies aimed at inter-provincial connections of electrical systems, Mr. Macdonald said.

France pushes nuclear

The French government has announced plans to build 13 new nuclear power stations beginning this year and to ban the use of central heating in private homes during six warm months to save energy.

Announcing a new series of energy-saving measures, Premier Pierre Messmer said France will stress nuclear power as an energy source "because we are well experienced and because we have had nuclear power since the end of the Second World War."

The stations will take five to six years to build at a cost of more than $200 million.

M. Messmer noted that the extra electricity the new plants will provide will be equivalent to the total electric power capacity available in the country in 1962.

In other energy-related decisions, the French Premier said domestic coal and gas prices will go up 14.5 per cent with increases for industrial users even higher; domestic heating will be limited to a maximum temperature of 68 degrees and will be

banned from April 15 to October 15, and France will undertake large-scale exploration for new petroleum resources, particularly under the ocean bed.

New subway



Kiss-and-ride facility on Hydro right-of-way

Subway trains began operating along an extension to Metro Toronto's original Yonge Street subway exactly 20 years to the day after the opening of the original 4.5-mile line.

The extension cost an estimated $140 million, more than twice the cost of the original line from Union Station to Eglinton Avenue.

A unique feature of the two northern stations—Sheppard Avenue and Finch Avenue—is air expansion chambers at the approach to prevent transit riders from getting that windblown look when a train enters the station. The chambers reduce the air velocity and pressure as trains approach.

Construction of the northerly extension from Eglinton station began in 1968. A 4.02-mile section, including stations at Lawrence Avenue and York Mills Road, opened last spring.

Another feature of the latest section from York Mills to Finch is the installation of aluminum strip walls over acoustical material to reduce noise levels on the platform. There are 11 escalators at the Sheppard station, to be used by an expected 30,000 commuters daily and nine escalators at Finch station, which is expected to accommodate 50,000 to 60,000 riders a day.

Yet another unique feature of the Finch station is its kiss-and-ride facility, built on a piece of Ontario Hydro right-of-way sold to the Toronto Transit Commission. The kiss-and-ride terminal is a circular building able to handle 125 vehicles at a time. The idea is to provide a means for spouses to drop off their partners at the station without causing a traffic jam.

Parking for 800 vehicles has been provided near the station on the Hydro right-of-way east of Yonge Street. Ultimately, there'll be room for 4,000 vehicles at the spot.

Just two days before the official opening of the new extension by Premier William Davis, Metro Council approved a $41 million underground extension of the Bloor-Danforth subway in Scarborough. The extension will run from the existing Warden Avenue terminal to a new terminal at Eglinton Avenue and Kennedy Road.

Approval of the project by the Ontario Municipal Board will permit Metro to undertake two subway projects at the same time. Construction was scheduled to begin in the spring on the five-mile Spadina line from Wilson Avenue in North York to the St. George station on the Bloor-Danforth line.

municipal briefs

Petrolia PUC has been asked by town council to look into the possibility of starting a cable television system in the area. One councillor said he could "guarantee that private enterprise would be able to come into the Petrolia-Wyoming area in the next two years and start making money on a cable system."

A woodpecker is posing problems for Peterborough Utilities Commission. The bird is causing damage to one of the utility's wood poles and manager W. Howard Powell has suggested installing a pole nearby to supply the bird with food. But Mayor Phil Turner cracked that another pole wouldn't do much good because the bird was likely "looking for currants."

Guelph Hydro has decided to rescue cats from atop its poles and absorb the costs. Hydro people get drawn into the act on two counts: firstly, aerial buckets make such rescues relatively easy and, secondly, they don't want people trying the rescue attempt themselves and getting injured in the process.

It was a close shave for bearded Etobicoke Hydro lineman Wilfred Andrews, 26, when a 4,000-volt line he was working on short-circuited. Mr. Andrews' beard and some of his clothing were burned off in the mishap.

Burlington PUC has named J. Lloyd Jackson general manager to succeed E. Washburn, who died recently. Mr. Jackson joined the utility in 1958 as Hydro engineer and was appointed chief engineer in 196 T. J. MacDonald has been named treasurer and secretary of the commission. He has been with the utility since 1966 when he began as an accountant. Mr. MacDonald was appointed treasurer in 1970. A third new appointment is that of J. D. Kelly, who becomes senior Hydro engineer. He has been assistant Hydro engineer since 19

Meaford PUC is getting out of the business of renting water heaters. Manager Roy Bishop says the utility will hand over the service to a local tradesman at the end of the year. Mr. Bishop said rental customers will be given an opportunity to buy the units at reduced rates. He adds that the utility will encounter a $6,000 deficit by the end of the year if the present program continues.

So proud is the town of Pickering of its involvement with nuclear power through Pickering generating station that it has incorporated the symbol of the atom at the top of its crest. Other symbols on the town crest represent industry, agriculture and Lake Ontario.

Hydro news

July/August, 1974

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features

1 How to cut back on energy use

Ways in which energy can be conserved are suggested by an Ontario Hydro expert in the utilization field.

5 Fusion still poses 'enormous problems'

According to a Montreal physicist, Canada's best long-run bet may be a marriage between fission and fusion reactors.

6 What's the boss doing today?

Profile on four municipal utility managers who find that versatility is the key to success.

13 Where history keeps on living

Unusual hobby of two Waterloo men is the acquisition and refurbishing of old electrical equipment.

16 Dream of national grid a step nearer

A coast-to-coast power network has long been the dream of some far-sighted Canadians. Now Ottawa is providing funds for a feasibility study.

18 Lighting the way

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the cover

Mercury vapor streetlights illuminate this stretch of Toronto's Bloor-Danforth. Newer high-pressure sodium lighting may be seen in the distance. See article on lighting starting on page 18.
Photo: R. Brown

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hydro news, volume 61, number 4

Published by Ontario Hydro, 620 University Ave., Toronto.

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Printed in Canada.


How to
cut back on
energy use
by G. Harold West

We have an obligation to leave some natural resources for future generations — or at least leave them useable replacements.

Romantics may say, "Love makes the world go round." Realists insist it is "Energy." Engineers merely note that the more efficiently things go around, the better it is for everybody.

Making things go around the North American way has traditionally involved high demands for energy, and lavish squandering of it. Our per capita energy use is more than double that of Western Europe and three times that of Japan. Yet industry today spends less than 2 cents of each of its dollars on energy, consumers less than 5 cents.

Abundant low-cost energy is basic to our high standard of living. But our standard of living keeps rising, our energy demands keep escalating, and our energy costs are inflating.

By the year 2000, Canada's energy needs will have increased fourfold from the amount we used in 1970. This country has been generously endowed with energy sources, but "generous" does not imply "limitless".

To a large extent today we are using resources that are not renewable, drawing from deposits made millions of years ago. We have an obligation to leave some of these resources for our children — or at least leave our descendants useable replacements.

Fortunately, there are already engineering efficiencies available that could slice 25 per cent from our energy demands, if we'd use them. This would not only extend the life of our non-renewable resources, but minimize environmental problems. There are four basic things that can be done:

•Allocate special energy sources (like oil and gas) to needs they serve most suitably, and improve efficiency of production from all our energy sources.

•Improve ways we transport and distribute energy.

•Consume energy more efficiently.

•Develop a "conservation ethic" that shifts emphasis from a "throw-away society" to one that stresses refillable containers, more reliable and durable equipment, recycling of basic materials, and design of smaller machines that save both on the energy needed to power them and the energy needed to manufacture them originally.

There are costs, however: Higher real costs in originally purchasing longer-lasting, more efficient equipment; less tangible life-style costs in replacing energy-wasting high-powered cars and spacious well-windowed homes with small cars and apartment suites. Both use half the energy to provide the same basic service.

As energy costs rise, some life-style adjustments will take place almost automatically. Lower operating costs will become more important than higher original costs for good equipment. Economists call it a cost-benefit equation.

Other adjustments will result from rational private resource planning, still others from government leadership through legislation.

In the 30 years between 1970 and year 2000, the use of all of Canada's primary energy sources will grow. But some will grow proportionally faster than others.

By the year 2000, the main ingredients in a quadrupled energy "pie" will be shifted this way: oil and gas from 66 to 63 per cent; water power from 23 to 12 per cent; nuclear sources from essentially none to 18 per cent. Electricity, of course, is a secondary energy source manufactured from these primary sources.

Significantly, in year 2000, a major part of our energy needs will still be met by oil and gas. Nuclear power's share will have grown rapidly; water power's share will have decreased markedly as fewer hydro-electric sites become available for development.

Ways we use our energy will shift, too. The major users of fuel now are transportation, general industry (not including the energy and fuel-supply industry), and people in the city and on the farm. In that order.

By the year 2000, thermal-electric generation will be by far the biggest fuel user, transportation next, followed by the fuel supply industry. General industry will ta fourth place. City and farm residents wil only be consuming about 5 per cent of supplied. The big jump in thermal-electr generation fuel needs will result primari from new water-power resources becor ing even more remote.

We can foresee our energy needs. W can predict our energy sources. More e cient production and consumption of o energy can help balance the two projec tions.

Our reserves of gas and oil, howeve large, are limited. They are also particu suited to special uses, such as truck an air transportation, and the petrochemic industry.

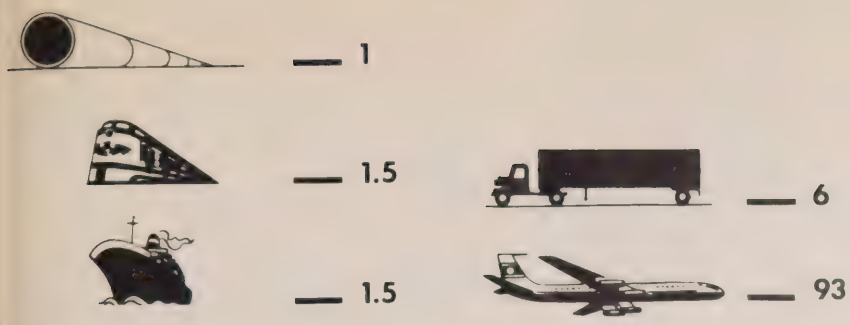
Electricity seems likely to displace th for many applications, like space and w heaters, automobiles and trains. The hi toric annual 7 per cent growth of the el tric industry may well accelerate. This emphasizes the importance of better e ciency in converting primary energy sources into electricity, so we use up l of them.

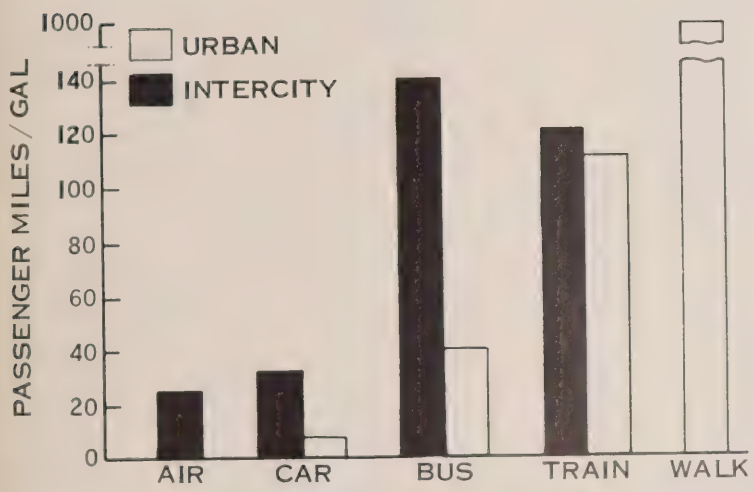
In 1972, water power provided 75 pe cent of Canada's electricity; coal, 15 p cent; oil, gas and nuclear sources, 10 cent. By the year 2000, nuclear will pro 44 per cent of the tremendously increa demand; water power only 30 per cent gas and coal will account for the rema der.

In efficient hydro-electric generatio Canada's record is high, running over per cent, and no significant improvem can be expected. But these water-pow stations are generally remote from the power users, so there are efficiency lo in the long transmission lines.

Efficiencies of thermal-electric gen tion with fossil fuels have improved st since 1947, and the newest coal-fired plants have an overall efficiency of 40 cent. Major improvements in steam-tu plants will require new developments high-temperature metallurgy — and th

RELATIVE ENERGY USE FOR FREIGHT TRANSPORT





RELATIVE ENERGY USE FOR PASSENGER TRAVEL

ill be needed, because pollution control quipment will reduce their efficiency pproximately 3 per cent.

Nuclear stations are considerably less nergy-efficient than modern fossil-fuelled ations, and the limitation again is a need r new high-temperature metals. Improve- ents will come, but even so the Candu stem will not be more efficient than mod- rn coal-fired stations.

Despite lower thermal efficiencies — 30 er cent — the Candu system gets twice s much energy per pound of uranium as mpeting enriched uranium reactors. ven so, Candu recovers only 1 per cent of ranium's potential energy before the fuel as to be recycled or enriched. Research continuing.

The low efficiency of thermal-electric eneration means there is a lot of wasted eat — 60 per cent of the raw energy input r coal, 70 per cent for uranium. This is a vast amount of low-temperature heat, and it would be nice to use it.

Most practical use is space heating. A 2,000-megawatt Candu plant could supply all the residential and commercial heating needed by a city of 1,700,000, in theory at least. There are obvious problems in placing a plant that size in the centre of an established community three-quarters the size of Toronto.

Thermal-electric plants designed to produce both electricity and useable heat will have to be substantially smaller than those ordinarily built today, and designed so their heat and electric output matches the needs of the surrounding community. They cost more to build, per unit of electric output, than today's plants. But they'd do two jobs, more than doubling their efficiency in using fuel.

It takes energy to deliver anything, including energy, from one place to another. The fuel supply industry is expected to consume 17 per cent of all Canada's energy demands in year 2000. Electric transmission and distribution efficiencies, about 85 per cent, are good but open to improvement.

A quarter of Canada's energy resources are used to move people and goods. There has been a continuing shift to less efficient means of transportation. Speed and flexibility may be desirable, but they are energy-intensive.

Moving freight by air takes almost 60 times as much energy as moving it by rail. Yet air freight is growing 15 per cent each year.

Passenger traffic shows similar dramatic energy wastes, with low vehicle loads, traffic congestion and short distance hauls in cities. Walking is over 100 times more efficient than going by car, and a bus five times more efficient than a car.

For inter-city travel, buses are only slightly more efficient than trains, but four to five times as efficient as airplanes and cars. Yet automobiles account for over half of the energy we consume in transportation, and over 13 per cent of our total energy consumption.

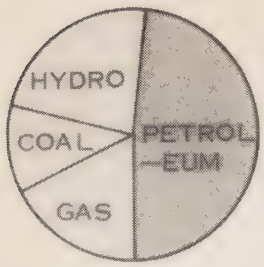
Vehicle speed and weight are both options of the owner, and both significantly affect fuel consumption. For a 4,000-pound vehicle, fuel consumption increases about 40 per cent from 30 to 70 mph. With both vehicles travelling 70 mph, the big car consumes almost 40 per cent more fuel than the small one.

Addition of emission control equipment over the past three years has also increased energy consumption — but only minor reductions in vehicle weight or speed would be needed to compensate.

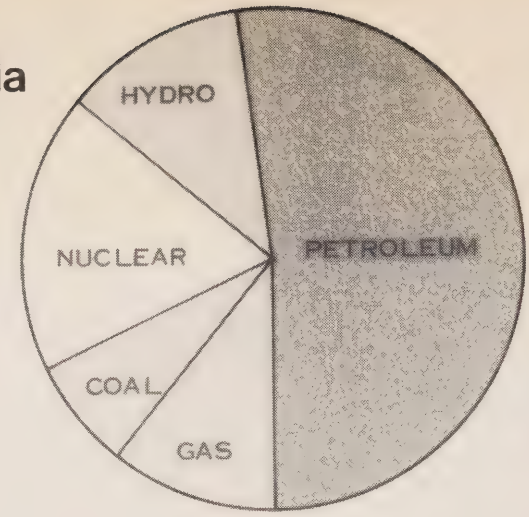
Electric automobiles hold great potential both to solve emission problems and halve the primary energy demand for personal transportation. A 2,000-pound electric car can run 10,000 miles a year for 3,200 kWh at the household meter — less than the energy consumed by the electric water heater.

Need for an electric car is not yet urgent, but it could be in 20 years. What's required is development of a practical high-capacity battery, and the electric

Primary energy sources · Canada

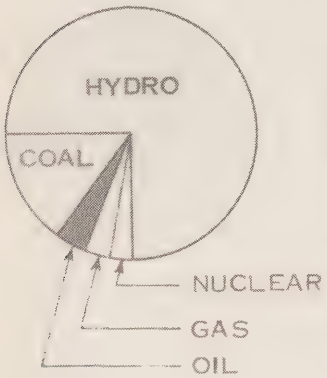


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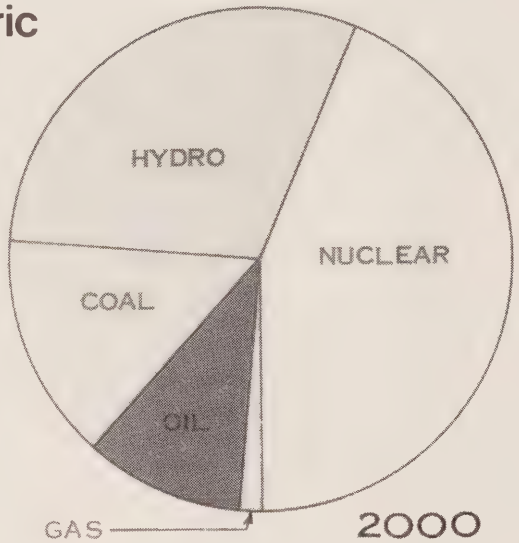


2000

Sources of electric energy · Canada



1972



2000

industry which stands to benefit most from the electric car should consider supporting research and development.

Until the early 1960's, most of Canada's trains were powered by coal with an efficiency of about 5 per cent. Diesel-electric locomotives increased efficiency by a factor of six. Now both Canadian railroads are actively studying a changeover to electric energy.

An electric locomotive has triple the tractive effort and twice the life of a diesel, and it uses any fuel a generating plant can use. In addition, electric locomotives make 15 per cent better use of the energy in a barrel of oil. Capital costs of the overhead power supply is the major deterrent, but if diesel fuel prices keep rising electrification will become increasingly attractive.

In 1970, Canada used one-quarter of its energy to heat the places where people lived and worked. Most Canadian homes with conventional oil or gas heating are insulated to National Building Code standards. Electrically-heated homes are insulated to local provincial Electrical League requirements. It takes one-third less energy to heat the better insulated house.

Apartment units typically require only half as much heating energy as a single-family dwelling. The trend to apartment living is energy efficient.

Modern office buildings run to large expanses of single glass, minimum insulation and high air leakage. The contractor ordinarily doesn't pay the operating costs, so doesn't worry about anything except the original cost. Easy construction improvements could give energy savings in the order of 25 to 30 per cent.

At present fuel prices, the extra cost of good insulation can be paid off in five years. A fringe benefit is that the builder can install a smaller (and cheaper) heating and air-conditioning unit.

Large heat pumps — reversible air conditioners — are now used in office buildings to transfer heat from the central core to outside portions. Over-all thermal efficiency of these buildings can be two to three times that of conventional building

There is a lot of talk about the waste energy by inefficient household appliances, but not much substance to it. Giv Canada's climate and the relatively few home air-conditioning units, an inefficie toaster or tea kettle or iron merely helps heat the house, probably quite efficientl

Industry, however, accounts for 32 p cent of Canada's total fuel consumption There is ample scope here for increase energy efficiency through such conserv tion measures as better insulation and h management. Potential savings have be conservatively estimated at 30 per cent.

Then, we can make things smaller. T smaller the machine, the less power it takes to operate, and the less energy w needed to make it.

Driven 50,000 miles, a compact car h cost only half as much energy to manuf ture and operate as a medium-size car. The energy saving is equivalent to heat an average house for a year. Against a size luxury car, the energy saving is tw years of home heating.

There are also significant energy sa ings in salvaging and recycling basic m rials, with aluminum offering the greate potential.

The greatest potential for energy sa through materials use is through exten the life of the product. Minor increases first costs can readily double or triple t useful life of a machine or product, thu reducing by a half or a third the energy required to produce it.

Lower thermostat settings can redu heat requirements 5 to 10 per cent. Lo highway speeds can clip gasoline con- sumption by a least 15 to 25 per cent. (pooling in home-to-work travel can red energy consumption by factors of two three or more.

A little thrift can help fend off an en shortage. □

Mr. West is supervising engineer in the utili section of Ontario Hydro's electrical reseai department.

Fusion still poses enormous problems

anada's best bet in the long run may be a arriage between fission and fusion reac- rs, says a University of Montreal physi- st.

In this concept, controlled ermonuclear fusion would be used as a urce of neutrons to accelerate the cre- ion of nuclear fuel for more advanced pes of fission reactors.

In Candu reactors, neutrons split U235 oms to achieve and sustain the chain action. Some neutrons are also captured natural uranium (U238) atoms to breed ssionable plutonium. A source of neu- ons will also be required for future reac- rs fuelled with thorium to create ssionable U233.

However, Dr. Jiri Teichman told a Cana- an Science Writers' Association seminar Varennes, Que., that "enormous difficul- es" stand in the way of achieving a fusion action in which the temperature must pproach that of the sun.

Some researchers believe that fusion ill be achieved in the laboratory in four or ve years. Subsequently, it is expected to ake 20 to 25 years or longer to develop a ommercial fusion reactor.

"The problems are far from being olved and these are very serious prob- ms," said Dr. Teichman. Later, in reply to a question, he said fusion is a more complicated task than was splitting the atom 40 years ago.

Several ways of achieving fusion have been proposed but, most commonly, heavy hydrogen isotopes would be fused by intense heat to form helium and spare neutrons. If successful, hydrogen would provide an unlimited source of fuel for future generations.

Two methods are under investigation, mainly in the U.S., Britain and the Soviet Union. The most favored involves heating a deuterium-tritium mixture with an electric current and containing the plasma in a powerful magnetic field. Another possible technique which is gaining attention uses a high-powered laser beam to heat the plasma.

Aside from the difficulties of attaining temperatures as high as 100 million degrees, even for a required reaction time of a millionth of a second, Dr. Teichman said there are severe metallurgical problems to be solved. The walls of a fusion reactor may have to be replaced every two or three years, he said.

Dr. Teichman said that despite the difficulties, a demonstration fusion reactor may be in operation in the 1980's.

Hydro-Quebec is using a relatively low-powered carbon dioxide laser to focus pulses of energy on a cold, dense helium plasma. Plasma heating has been demonstrated and experiments are planned with a high-powered laser.

The laser option was described by Dr. Claude Bechard of the Hydro-Quebec Research Institute. The existing CO_2 laser develops peak power of 5 megawatts with a pulse duration of 180 nanoseconds. (A nanosecond is one billionth of a second.)

Dr. Bechard said that by 1975 or 1976, Canada may have carbon dioxide lasers powerful enough to devise a "breakeven" system in which energy output would equal energy input.

Dr. Teichman said fusion research was not only a question of money. Canada would require a laboratory with at least 100 specialists and a number of years of experience to develop significant results.

The combination of fission and fusion reactors may be the best for Canada, but it would require "quite huge" sums of money, he said.

A consortium of five Quebec research organizations is undertaking a year-long study, financed by the federal government, on a possible fusion research program for Canada. □

What's the boss doing today?



'ell, if he's managing a local utility, he's obably acting as a planner, consultant, gal adviser, administrator . . . or he just ay be out fixing the lines.

Rae Hopkins

the age of 41, George Hammond turned his briefcase and business suit for a pair climbing spurs and safety belt. That was years ago, and today Mr. Hammond esn't regret the move one bit.

Strapping on the spurs for the first time elled the end to a 22-year career in the counting and stock control departments a Port Elgin broom factory. Not only that. st a few months before taking over the as manager of Port Elgin Hydro, Mr. mmond stepped down as one of the util-'s commissioners. He went from nployer to employee, from Ontario unicipal Electric Association to Associa-n of Municipal Electrical Utilities.

In many ways, George Hammond isn't pical of the average municipal utility anager. But they're not a breed that is sily stereotyped.

Your "typical" utility manager may be electrical engineer. But, then, he could a civil engineer, or possibly a graduate business administration, or both. He ould hold a certificate from a technical stitution. Or he may have little formal ducation, but a degree of professionalism at only comes with long years of experi-nce.

Whatever his educational background, e utility manager is perhaps one of the ost knowledgeable and versatile men in e community. His formal training never ally ends because, through his affiliation ith the AMEU, he's involved in a continu-g education program of conferences, minars, and study sessions.

Ron Mathieson, the AMEU's manager-ecretary, says the man at the helm of the cal utility is somewhat of a "jack of all ades." He's a planner, a consultant, a gal advisor, an administrator, and some-nes, like George Hammond, he even dou-es as a lineman.

The utility manager, Mr. Mathieson says, ust plan for system expansion up to five ears in advance of when additional elec-ical service will be required. Like the city ngineer, the utility manager must know where new streets and highways, new residential and industrial subdivisions will be located.

The utility manager has to assume the role of consultant when it comes to street lighting, assisting the municipality to select the system best suited to its needs. And he has to be conversant in law.

For example, Mr. Mathieson says, the utility manager must know the Power Corporation Act, the Public Utilities Commission Act, the Municipal Act and a variety of others such as the Condominium Act. He must be familiar with the Labour Relations Act, with conciliation and arbitration procedures.

The average municipal utility manager is about 50 years old, give or take a couple of years. "That age cycle runs throughout the whole industry. A bunch of them came into the business just after the Second World War," Mr. Mathieson says.

"He's usually married, a family man, and takes a keen interest in his community. His activities run the gamut from being a board member of the local art gallery to the St. John Ambulance, the United Way, the church, a service club membership, and a seat on the chamber of commerce or local businessmen's association.

"The utility manager is what you would have to call a very solid citizen — a man with all the attributes of a good neighbor," Mr. Mathieson says.

While the prime responsibility of the local utility is the provision of electrical service, many commissions look after water distribution while some operate local transportation and other services.

And just as the municipal utility manager is a versatile man, there's a versatility of management styles.

Take, for example, Bill Mullin, 54-year-old general manager of Windsor Utilities Commission. With about 64,500 customers, a staff of more than 400 and assets exceeding $45 million, Windsor rates among the largest municipal utilities in the province.

Mr. Mullin sees himself as an administrator. Although he's a graduate electrical engineer (University of Toronto, 1951), he's seldom involved in direct engineering work. The utility has a staff to do that, for both its Hydro and water divisions.

Mr. Mullin's five-member commission agrees with his administrative role. In a four-page document approved several years ago, the commission spelled out the general manager's role, in part, as being "the chief administrative officer of the commission."

The job description, one of the few on record for utility managers, further states the general manager is responsible for the "effective and efficient administration of all activities under the jurisdiction of the commission in accordance with the policies and directives which are adopted by the commission as well as various legislative acts as they apply to this utility.

"All officers and employees of the commission are responsible to the general manager through the lines of authority and responsibility which have been established. The general manager reports to the commission on major administrative and operational matters and the commission, in turn, deals with such administrative and operational matters only through the general manager," the job description says.

The job description, and those of other key personnel, resulted from a 1971 recommendation of a management consultant firm brought in to suggest salary and organizational changes for the utility. The result was a major restructuring.

A tall, well-dressed pipe-smoker, Mr. Mullin reports to his second-floor office on Ouellette Avenue shortly before 9 every morning. He's usually there until around 5:30, but has no routine quitting time.

From a mahogany bookcase which matches his desk and the wall panelling, Mr. Mullin takes down a four-inch-thick, loose-leaf binder on which is printed the words "Policies and Procedures — Windsor Utilities Commission." Its contents run the gamut from the executive job descriptions to distributing power at 27.6-kV and



purifying the city's drinking water drawn from the Detroit River.

Mr. Mullin says his utility was a pioneer in 27.6-kV distribution and now has more than 600 transformers operating at that voltage.

A concentration of heavy industry, especially automotive and tool production, makes Windsor the fifth largest manufacturing centre in Canada. Seventy per cent of the utility's electrical revenue is from commercial and industrial customers.

While the demand for power in Ontario invariably reaches its peak in winter, last year Windsor's peak of 295,000 kilowatts came in the summer — the result of a southerly location and a high saturation of air-conditioners.

While many proponents of regional government have suggested that utilities should be responsible only for the distribution of electricity and get out of the water business, Mr. Mullin disagrees. He says: "A PUC should provide both services, which are closely related in terms of customer need. Why should the customer have to deal with two agencies when one will do? Also, if these services are operated separately costs are bound to increase due to the loss in efficiency resulting from shared functions such as reading meters, billing, computer use, purchasing, accounting, administration and so on."

The commission meets twice monthly in Windsor, and it's no rubber stamp affair. "They take their responsibilities very seriously and want to know that everything is being done to make the organization productive and efficient," he says. "It's my job to see that this drive for productivity and efficiency extends throughout the organization."

Agendas for a meeting may range anywhere from 50 to 100 pages, yet meetings attract steady attendance from the news media.

The utility was faced with a nine-week strike in 1973 and managed to survive with the help of supervisory personnel. "Neither the Commission nor the union appear anxious to repeat that experience," Mr. Mullin says.

While studying at the University of Toronto, Bill Mullin did some part-time work for Ontario Hydro as a junior engineer. After graduation, he enrolled in the Westinghouse training program in Hamilton for a two-year stint.

From there, he went as a junior engineer to the Cleveland Electric Illuminating Company, Cleveland, Ohio, "to learn something about how U.S. utilities operated their systems before settling back in Canada." Mr. Mullin began his career at Windsor in 1955 and held a succession posts before being appointed general m ager in 1971.

Even in a medium-sized utility like Pe borough Utilities Commission, administration comes foremost in the g eral manager's job.

Fifty-seven-year-old civil engineer H ard Powell has 21,000 customers, a 21- square-mile service area, water distribu and the city's zoo to contend with.

"Unless a manager lets his staff have responsibility — and sometimes that's h to do — he will be loading it on his own shoulders and reducing his effectivene Mr. Powell says.

Not known for mincing his words, Mr Powell has earned a reputation for bein outspoken. "It makes me mad when oth just sit around at meetings and say noth ing," he says.

Mr. Powell is perhaps most vocal on marketing of electricity. While many uti ties — Ontario Hydro included — are stressing conservation, Peterborough U ties Commission is strongly marketing-



Windsor Utilities Commission manager Bill Mullin oversees operation of the utility's data processing centre with department manager Mike Hosowich. At right, he checks on system expansion progress with the Hydro division's chief engineer, Dave Pope

pented, although it has cut back on its avertising programs.

"We're attempting to tell the people w're not short of electricity. It's silly not to — tlit's the one thing we have a reasonable spply of — and to do otherwise is being to sensitive to such organizations as Pollution Probe," he says.

Mr. Powell is a strong advocate of the elected commission system, and is songly opposed to regional government.

"With the commission concept, you get fellows who are supersensitive to the needs of the people. The board of directors is right in town and the people who elected it are right there, too. Commissioners can be be defeated at the polls if the customers are not satisfied with the service their utility is providing," Mr. Powell says.

"In a large organization," he adds, "you need a standing order to change the color of the lead pencils."

Like most municipal utilities, Peterborough is chiefly concerned with the distribution of electricity. But the commission is seriously considering going into the generating business, too, by purchasing the Quaker Oats Company's 2,700-kilowatt hydro-electric plant, located within the city limits.

Peterborough Utilities Commission has provided water service since 1902 and electrical service since 1914. It inherited the zoo in 1932 when a former manager brought back an alligator from a convention in Florida. The staff built a pond for the beast near the pumping station and the townsfolk, hearing about the utility's mascot, began donating other animals — the idea caught on.

When a new water treatment plant was built, a few years ago, the utility developed a park there and expanded the zoo. It's not uncommon for as many as 7,000 visitors to stroll around Filtration Plant Park and zoo any summer weekend.

The utility had the gas department for a number of years, too, but the citizens persuaded the commissioners to sell it and in 1958 it was purchased by Consumers' Gas Company for $1.3 million, one of the highest prices ever paid by the gas company for a municipally-owned natural gas distributing agency.

Mr. Powell says $500,000 was used to build a new senior citizens' home, another $500,000 was spent on a sewage treatment plant and $100,000 was used to set up a study fund for the formation of a college for Peterborough. The study led to the establishment of Trent University.

A graduate in civil engineering from the University of Toronto in 1939, Mr. Powell comes from an engineering family. His father, who was a city engineer and commissioner of works in Toronto for many years, was partly responsible in the early 1900's for the building of the Bloor Street viaduct with provision in it for a subway system. That vision became reality in 1967.

Mr. Powell also has a brother, a son and two nephews who are all professional engineers.

Convinced that the local utility manager should become involved in community activities, Mr. Powell has been closely involved with the United Appeal, the Kinsmen Club, the Automobile Club, the local ski club and is an officer of the American Waterworks Association.

He's a past president of the Electrical Utilities Safety Association, was an AMEU director-at-large for medium utilities and sits on its engineering board, marketing training committee, accident prevention and safety committee, and rates committee.

Bill Mullin and Howard Powell are essentially administrators. But in the smaller utilities the manager is still a jack-of-all-trades. Take 40-year-old Hartley Watson, a former Ontario Hydro lineman who

Peterborough Utilities Commission is considering going into the power generation business. Manager Howard Powell is shown outside the Quaker Oats Company's hydro-electric station and discussing a possible takeover of the plant with his commission.



took over as manager-superintendent of Kincardine PUC five years ago, for example.

Mr. Watson feels a utility manager should be free to administer the workings of the utility, but the reality of the situation forces him to do otherwise.

Mr. Watson has to be as much at home in a bucket truck, connecting an electrical service or in a trench installing a water pipe as he is in his carpeted office.

He says that in a smaller utility the manager is generally required to assist the outside crew because most of them do not have sufficient experience to work on main or primary distribution lines on their own.

"Experienced linemen," Mr. Watson says, "don't stay around the smaller utilities for too long. They move on to the larger ones where the money is better."

Kincardine is a community that's expanding at a phenomenal rate, chiefly because of the building of the Bruce nuclear development.

However, says Mr. Watson, growth has its disadvantages. Kincardine PUC has been forced to boost rates for both its water and electrical services to acquire funds to carry out system expansion.

While he agrees with the commission concept, Mr. Watson says it's "unfortunate in a small community that people who





In a small utility like Kincardine's, manager Hartley Watson is as much at home behind his desk as he is checking out the utility's water treatment equipment or assisting a supplier to unload material.







George Hammond, manager of Port Elgin Hydro, believes customer relations work is a big part of the job. People are used to calling him for advice nights, weekends or holidays.

would make the best councillors and commissioners will not seek election because of the problems public service could create for their own businesses.

Mr. Watson has not yet served on any AMEU committees because of the workload at his utility, although he does sit as a director of the Georgian Bay district of the Ontario Municipal Waterworks Association.

"A man that's strictly in a managerial position has time to serve on various committees, but I'm afraid that's next to impossible in a small utility," Mr. Watson says.

In nearby Port Elgin, George Hammond operates from a battered pick-up truck and an office about the size of an elongated phone booth. A rugged, cigar-smoking individualist, he hates office routine and feels that in a small utility the manager must be out with the crews, or doing customer relations work.

When he agreed to accept the manager's job, Mr. Hammond borrowed a pair of spurs and safety belt and learned to climb the 15-foot clothes-line pole in his back-yard. He recalls that going up was no problem, but "coming down was a sonovabitch".

Unlike managers in larger centres, Mr. Hammond does not "dress up" to come to work. He wears a heavy plaid work shirt, khaki work trousers, a parka and a dark brown cardigan.

"I guess I was sort of a working foreman when I took over, and in a sense I still am. But, I don't climb any more — I just hold the other end of the rope now."

The desk in Mr. Hammond's tiny, cluttered office, which he says is clean enough to live in and dirty enough to be healthy, is piled high with trade journals, AMEU manuals and drawings depicting the town's electrical system.

On the walls are certificates to show he's passed a Westinghouse transformer maintenance course, he's a certified residential lighting consultant, an electric heating consultant, and his proudest possession is a Sangamo Company certificate for passing a two-year home study course on metering.

"About 1,000 people in the province enrolled in that course and only about 100 completed it."

Regular work hours are from eight to five, but seldom does Mr. Hammond adhere to that. "I like to solve electrical problems — when I can — anytime, day, night, or weekend."

When he took over, Port Elgin Hydro served about 900 customers, and he knew everyone in town and where they lived. B now the utility has close to 1,700 custom ers and has almost doubled its load in th last five years — due to the proximity of t Bruce development.

Mr. Hammond says that the biggest problem with such rapid expansion is ho to finance it. When the utility first contracted for power from Ontario Hydro in 1932, it issued a $32,000 debenture whic was retired in six years. No other debentures were issued by Port Elgin Hydro ur 1970. Since 1971, the utility's debenture debt has climbed to $230,000 and this ye Mr. Hammond expects to have to purcha at least $100,000 worth of material and install another substation at a cost of ab $70,000.

"How to pay for all this expansion is a problem we haven't yet solved. We can' say no more expansion, we're a public u ity. But the money to meet our needs jus isn't forthcoming other than by borrowing," he adds.

Mr. Hammond maintains that one of t great advantages in belonging to the AMEU is that he can pick up the telepho anytime and "pick the brains of some of the smartest utility engineers in the cou try."

He's a past president of the Georgian Bay district of the AMEU and served a y as a director-at-large for small utilities o the provincial body. He's a member of th provincial marketing committee and say the most interesting committee he ever on was the one that organized the AME trades training courses.

It's a rewarding job, and most utility managers say that if they had it to do all over again, they would, indeed, choose municipal utility management as a caree for they have no regrets.

George Hammond has only one — th he waited until he was almost 42 years to get started. ☐



Where history keeps on growing

Two Waterloo men make the acquisition and refurbishing of old electrical equipment their hobby.

The sign on the door says, "E.P. Weissgerber, Electrical Repairs, Second Floor".

That's your introduction to one of Waterloo's oldest residents and certainly one of the few surviving men involved with the coming of Hydro in 1910.

At 81, Percy Weissgerber is still active. He goes to his repair shop in downtown Waterloo every day. His job: rewinding and repairing electrical apparatus.

He does some of his work for Waterloo businessman Heinz Peper, who is also somewhat of an electrical wizard.

"Percy taught me a great deal about obscure electrical machinery and principles. In fact, he's forgotten more about electricity than most people in the business ever learn," says Mr. Peper.

Both men are fascinated by old electrical apparatus. Mr. Peper locates and acquires it and Percy fixes it up.

Heinz Peper has an area in the basement of the Waterloo business block which he owns — the same building where Mr. Weissgerber has his repair shop. Here he keeps a great deal of old equipment including DC motors, generators, switchboards and even a mercury rectifier.

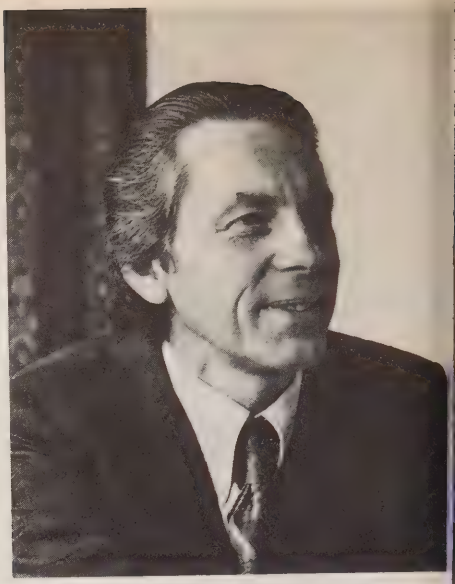
"See that motor over there," Heinz said, pointing to a huge piece of equipment on the floor weighing several tons, "that's from a store in Toronto."

Then Percy threw a few switches — there was a blue flash — the mercury rectifier started up and soon the elevator motor was purring like a kitten.

And so the story goes. Each piece of equipment in that room has a history and each piece works, largely because of the time spent by Percy in his repair shop two floors above.

Mr. Peper finds the hobby a relaxation from his plastic and rubber materials business. Mr. Weissgerber says the restoration

A man's home usually becomes his castle, but Heinz Peper's place is actually a castle. He and friend Percy Weissgerber, an 81-year-old electrician, spend many hours working with equipment like the lathe, below, and the switch-gear, top right. They spend countless hours in the Peper palace discussing their electrical equipment collection





of equipment keeps him active and sharp. He has no intention of retiring, not yet, anyway.

With Mr. Weissgerber's help, Mr. Peper has restored thousands of dollars worth of equipment. Much of it is being installed in his new home, built much like a Medieval castle, in a secluded spot six miles away.

But the story really starts when, at the age of 18, Percy Weissgerber decided that this new-fangled phenomenon, electricity, might be a good vocation. One of his early jobs was wiring the first Hydro transformer station in Kitchener in 1910. Not too much was known about electrical theory, and men had to learn by their mistakes.

He recalls his part in helping to decorate Kitchener with electric lights for the official turning on of Hydro the same year.

"We strung sockets on wires all the way from the railway station to city hall. The bulbs were about three feet apart," he said. "I remember them running out of 110-volt light bulbs and having to switch to 220. I remember us mixing up some of the bulbs and when 110's were put into 220 outlets they went 'poof' when the lights were turned on," he chuckled. "I remember them announcing that store owners co tie into the decorative lighting free duri the ceremonies. All they had to do was install a fuse."

When the ceremonies were over, P helped take down the platform. There, the dirt beneath it, was the coffee pot by the dignitaries.

"It had been broken so they threw i there to get it out of sight. I fixed it anc still have it," he said. Little did he reali the time, but this was the start of a life collection of Hydro history.

It was Percy Weissgerber who insta the wiring in the home of Daniel Detw one of the founders of the Hydro orga tion. That was in 1912.

"He had a lot more to do with the c ing of Hydro than he ever got credit fo Mr. Weissgerber said. "Sir Adam Bec







e politician, Detweiler the 'leg man' who nt around the country on a bicycle, pro-oting the advantages of Hydro. I knew n well."

During the early days of electricity, Mr. eissgerber acted as contractor, inspec- and lineman in Baden. "I would do the iring, inspect it myself and then hook up the pole. Somebody had to do it."

Mr. Peper got into the electrical busi-ss through his friendship with Percy. th Mr. Weissgerber's help he established company known as Canadian Neutron-s, which built electrical laboratories for hools.

"There was a great need for teaching ls and we got in on the ground floor." He eventually sold this enterprise and came involved in the plastics and rubber business, but has always kept his interest in electricity.

With Percy's help, Heinz went out in search of anything old in electrical machinery. Engines, generators, appliances, lamps, switchboards and other related paraphernalia were fair game.

"Some people collect stamps and coins," says Heinz, "but what I collect weighs a little more."

About 10 years ago, Heinz bought some country property and decided to build his dream home.

"When I was a boy I dreamed of living in a castle. Now I've built one," he said.

And that's exactly what he's done. It's complete with leaded windows, cut stone walls and a slate roof that weights about 50 tons. It even has turrets and secret passageways. Not only is it probably the world's most electrified castle, with one fuse for every outlet and one outlet every four feet, but it's the only castle that has a huge generator as a lawn ornament.

More than 8,000 feet of wiring were used in the building and each room has its own electrical service. Wood carvings on beams, walls, stairways and doors are the work of Heinz' late father, who died five years ago at the age of 86. Heinz considers the building to be a monument to his father's creative ability.

In the stairwell, 30 feet above the main floor, hangs an old fashioned combination electric and gas chandelier which came from the opposition gallery at Queen's Park. Percy restored this fixture to its original condition.

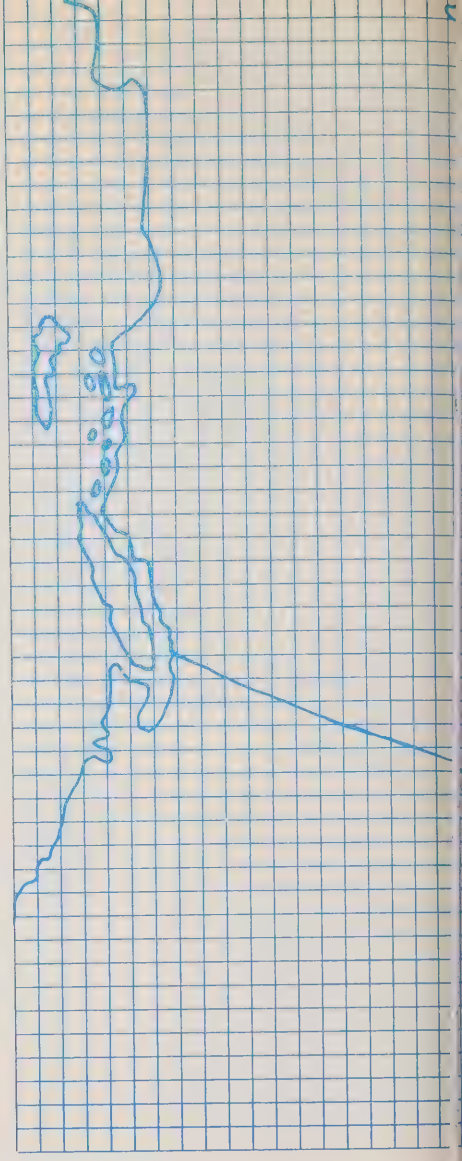
Near the house, concealed from view, is a building accommodating more than 100 glass-celled batteries for standby power should the regular service fail. A rotary converter changes the DC to 60-cycle AC in the event of a power failure.

"We're never without lights during a storm", says Heinz, "and there is always standby energy available to pump water in case of a lightning strike and possible fire."

Dream of a national grid a step nearer

Ottawa is providing funds to study the feasibility of a coast-to-coast power network for Canada

by Geoff White



"I can visualize a national energy grid anchored at one end on the Hamilton River (Labrador) and the other end on the Columbia and Taku. Once the matter of standardization and the technical problems of long-range transmission of power are fully overcome, I can visualize large blocks of inexpensive power being 'bumped' and 'wheeled' from surplus areas to deficient areas right across the land."

Sound like a quote from the First Ministers' Conference on Energy earlier this year? Far from it. The visionary was Prime Minister John Diefenbaker speaking in 1959. A national power grid was an idea which Mr. Diefenbaker supported avidly. But there was too much, too soon, both politically and technically.

Politically, Quebec's Premier Jean Lesage saw the abundance of cheap hydro-electric power in his province as an attraction to bring in new industries and he guarded his advantage jealously. Long-range transmission of electric power between provinces was a provincial jurisdiction, he maintained.

Without the link of Quebec there was no hope of constructing a chain.

Technically, the scheme was ahead of anything accomplished so far. In Russia, experimental work with line voltages in the 380-440 kilovolt range, which started in the 1930's, resulted in successfully moving power distances up to 650 miles.

It must be realized that a cross-Canada grid cannot be thought of as generating power in Halifax to light a street lamp in Vancouver in the way that natural gas from Alberta is used to cook a steak in Hamilton. A national power grid would not be merely feeding customers along its route but would also be picking up generation from various sources across Canada. It could be compared to a vast cross-country water pipe with feeders supplying communities along the way and pumps at different int vals contributing to maintain a regular pressure from end to end.

One result would be that as the peak followed the sun (or sunset) across Can ada, power would flow towards the peak area from both directions.

It would mean that instead of each uti having to maintain large blocks of reser generation specially for peaking periods power would be drawn from neighbouri non-peaking areas, say national grid ad cates. Taking the whole of Canada into account, the same security of service could be obtained with a smaller total o generating capacity than has to be provided for each area separately.

True, there is already a comprehensi network of interconnections involving t United States and Canada, but this is us ally a facility whereby power can be exchanged on a short-term basis as ne or surpluses arise, and supplies are int ruptible.

Whether the existing hardware whic provides the interconnections would b



ied for a permanent cross-country grid is technicality which would have to be udied.

There has been one particularly signif-ant technological development in long-stance line transmission since John Dief-baker made his forecast in 1959. Direct urrent transmission is now in practical se in many parts of the world including the ECL-built line which brings power from fe Nelson River to Manitoba.

Among the advantages of DC is the fact at the lines need only two conductors ompared to AC's three, and they can rry a heavier load.

One disadvantage is that the terminal quipment to convert power to direct cur-nt at the transmission end and back to ternating current at the distribution end is stly. A long line carrying large quantities of power is required to make direct current practical.

Operating Canada-wide rather than provincially would provide a more flexible generation "mix". In Newfoundland, for instance, it would provide a guaranteed market for the hydro-electric development of the lower Churchill River. Fossil fuel generation in Western Canada would take place near the sites of gas, oil and coal deposits and the resultant energy would be transferred to consumer areas in the form of electricity rather than in the form of bulky fuels. On the east coast, interest is still high on harnessing the Bay of Fundy tides and in the West, British Columbia is taking a serious look at development of geothermal energy.

Another advantage would be that a wider range of generation mixes across the country would provide a better opportunity to select cheaper forms of power production as first choice for basic loads. There are also economies in using larger generating units. Taking a large unit out of service for maintenance would not affect a national grid in the same proportion as it would a more localized area.

There can be no suggestion other than that it is going to take time before a coast-to-coast grid comes into operation, but there is harmony of thought across Canada. Energy Minister Donald Macdonald has proposed it openly and Ottawa is providing funds for a study. At the recent First Ministers' Conference on Energy, Premier Frank Moores, Newfoundland, said: "We believe that the concept of a national power grid is fundamental to a comprehensive national energy policy. We envisage a high-capacity transmission system from coast to coast which would be federally financed and which would operate as a common carrier."

Darcy McKeough, Ontario's Minister of Energy, has said: "Ontario's policy is that there be a national power grid, and Ontario is working towards that goal."

The exact when and the exact how is still in the future, but at least the why is understood. □

Lighting the way



ommunities are opting for ercury-vapor or high ressure sodium lighting r their streets. Each type as its advantages.

y Bill Settatree

rth America has seen a revolution in cent years in street and highway illumi- ation. Once popular incandescent lamps ave taken a back seat to fluorescent, ercury vapor and multi-vapor luminaires hich provide better illumination.

While some Ontario communities have tained incandescents for residential reet lighting, most have adopted ercury vapor for highways and arterial reets. The one major exception is ronto, which rejected mercury vapor cause of its bluish-grey color. But ronto has taken a close look at the third neration of outdoor lighting, high- essure sodium.

Toronto Hydro officials believe this light urce, which emits a soft, golden glow, ill surpass mercury vapor in a few years. is already being used in many urban eas in the U.S. and in several Canadian ties, too.

But apart from increased illumination, gh-pressure sodium lights offer another dvantage that should appeal to utilities, unicipalities and environmentalists alike. hey conserve electricity.

High-pressure sodium installed in the loor-Danforth stretch in Toronto several ars ago provides twice as much illumi- ation for half the energy consumption of e former incandescent lamps.

However, there are still some question arks about the lifespan of high-pressure dium equipment, basically because ost installations have not been around ng enough to provide a fair comparison ith mercury vapor. Which is one reason hy the Ontario Ministry of Transportation as been reluctant to move quickly into e sodium-lighting field.

Vern McCullough, illuminations design ngineer for the ministry, says mainte- ance on mercury lamps is minimal. We've been getting up to six years out of me lamps and they have certainly roven themselves," he says.

The ministry has an experimental ection of high-pressure sodium along ighway 400, in the north end of Toronto. ngineers are watching the test section

Bob Hicks, Toronto Hydro's chief engineer, compares large 500-watt incandescent with a 400-watt high-pressure sodium lamp. The high-pressure sodium lamp produces five times as much light as its incandescent counterpart.



closely and will use it as a basis for future lighting decisions.

"High-pressure sodium seems to be the trend in the future," says Mr. McCullough. "When the lifespan increases and capital costs come down, it will probably come into its own."

John Dawson, manager of Niagara-on-the-Lake's municipal utility and a recognized authority on outdoor lighting, agrees. "The big cost is in fixtures," he says. "Many utilities have a terrific investment in mercury vapor and would not want to change over."

On Toronto's Bloor-Danforth stretch, 541 sodium lamps, each of 400 watts, were installed about 120 feet apart alternating between each side of the street. The result: a surface-lighting level of 2.5 foot-candles. Previously, the lighting level was 1.2 foot-candles from a double row of 500-watt incandescent lamps spaced 100 feet apart. Systems like this use 55 poles a mile compared to 120 poles with the incandescents or 90 poles for mercury vapor.

Light from the high-pressure sodium lamps — produced by passing an electric current through sodium vapor — is a soft yellow-orange, distinct from the yellow of low-pressure sodium lights like those installed on Toronto's Allen Expressway.

Since the Bloor-Danforth installation, Toronto Hydro has extended HPS to at least a dozen other streets. "Never before has there been a light source that packs so much punch in a small package," says Don Corker, of the utility's distribution planning and design department.

"Generally, the eye sees best in the yellow-orange range. There is enough yellow to make a pleasant glow, and I believe it promotes a feeling of well-being and cheerfulness in cold weather."

In addition to low installation costs, Mr. Corker says there are important savings over incandescent lighting in reduced maintenance and longer life.

"Sodium lights have a minimum lifespan of three years and more likely





hting levels are sharply contrasted in se "before" and "after" photographs of onto's Bloor Street. Below: new street nts invariably involve the undergrounding other services, as evident in this portion of nge Street, south of Eglinton Avenue. ze of poles and overhead wires north of Eglinton intersection are in the process of ng removed. Lighting on upper Yonge eet was the source of controversy last r when city officials bowed to the wishes residents to retain incandescent fixtures.



four. That means a replacement trip every third year compared to one every six months to replace twice as many incandescent lamps," he adds.

Toronto Hydro's chief engineer, Bob Hicks, is convinced that the utility is moving in the right direction with its conversion to HPS. And Don White, manager of North York Hydro, says his utility has recommended HPS to its borough council for all future arterial street lighting.

"They have agreed with that position," Mr. White says. "As far as we are concerned, it makes sense not only from the point of view of maintenance costs and energy conservation but capital costs as well. When you erect a standard primarily for street-lighting purposes it becomes a major capital item. The fewer there are, the lower the cost."

Additional HPS has been installed along Kingston Road in Scarborough and in Mississauga. Scarborough Town Centre has also been illuminated by high-pressure sodium. However, Jim Curtis, manager of Scarborough PUC, says these lighting projects were exceptions to the rule and that his utility is "strictly a mercury-vapor utility".

"The public has been so accustomed to white light that there was some criticism over the Kingston Road project which was put in for Metro," he said.

Other installations of high-pressure sodium are to be found across Metro Toronto and in some small towns like Meaford where utility manager Roy Bishop installed a light because he thought the golden glow of the lamp would tie in with the "golden town" theme of the community.

But acceptance for high-pressure sodium is slow and one of Toronto Hydro's projects had to be scrapped because of public opinion. Incandescents were installed instead.

Fixture manufacturer Bill Hawley, manager of engineering for Powerlite Devices, says it's possible to use fixtures designed for mercury vapor with halide and sodium lamps, but the higher intensity of the lights usually creates a glare problem.

Because of the higher light intensity, high-pressure sodium lamps require greater pole heights and fewer poles are needed. It's for this reason that existing systems cannot easily be converted.

Commenting on the various light sources available, Mr. Hawley says: "There's just no way to get efficient outdoor lighting from incandescent lamps anymore. To try to do so would be pure folly.

"Incandescents produce about 20 lumens a watt compared to 120 for high-pressure sodium. Mercury comes in between with 60 lumens a watt while the later metal halide lamps (a mercury type) produce 100 lumens a watt."

Bob Day, of Canadian General Electric's lamp division, says while mercury is still the most popular, high-pressure sodium is the fastest growing light source, and his company is introducing a 150-watt high-pressure sodium lamp for residential street-lighting purposes. This is in addition to the 250, 400 and 1,000-watt lamps now in use.

In addition to exterior lighting, the low-wattage lamps are being used in factories to provide safer lighting levels at less cost. They're also being used in building illumination to provide a decorative effect.

In the United States, bolstered by an increasing crime rate and the energy crisis, high-pressure sodium lighting is creating new markets for the manufacturers who last year sold about $20 million worth of HPS lamps and fixtures, more than double the volume of 1972.

One of the biggest conversion programs was in New York City where, by the end of 1973, an estimated 1,200 miles of major thoroughfares were converted. Within the next five years, the city hopes to complete a $25 million sodium-lighting program for its 6,000 miles of streets.

One of the major reasons for the increased interest in such lighting south o the border was the ghetto riots of the 1960's and the mounting problem of after dark crime.

In some American cities, business ass ia tions have earmarked their own funds f improved lighting rather than await munic pal action. In other cities, special bylaws have been enacted to raise the funds. Ba timore was one such city, and, according to a utility spokesman, the lighting progra received more "yes" votes than any othe item.

Now, with the energy crisis that hit the nation late in 1973, manufacturers are stressing energy conservation in promot ing their product. Closer to home, the Ontario Energy Ministry has been asked consider hastening the use of high-pressure sodium to conserve electric energy.

Up to now, though, U.S. manufacture have capitalized on the crime problem while in Canada the emphasis has been traffic safety. Police authorities here are nevertheless enthusiastic about the effe on crime. Metro's deputy police chief Ja Ackroyd says a portion of Yonge Street recorded a 24 per cent decrease in crim during a six-month period after high-pressure sodium was introduced. In an adjacent incandescent-lighted portion o the street, the incidence of crime increased 55 per cent during the same period.

"Generally speaking, the better the lighting in an area the easier it is to poli he adds.

Aside from the traffic and security aspects, social changes have dictated improved street lighting in cities. More sure time for recreation plus the trend toward evening shopping, night-time u of universities and increased shiftwork have all added to the pressures for bet lighting. □

anadian Nuclear Association

Public understanding vital

timism about the future coupled with ncerns for public education and accep- ce were the strong points to come out his year's annual conference of the nadian Nuclear Association.

Meeting in Montreal, the 14th interna- nal conference attracted about 500 legates and focussed attention on ustrial potential, export markets, mestic expansion and some of the blems related to the industry.

One thing that came through loud and lar was the need to explain the benefits nuclear power in order to gain public eptance. The message was that the nadian nuclear industry has to take ps now to avoid the confrontations ich gave the U.S. nuclear program so ny stumbling blocks.

Outgoing president A.J. O'Connor, neral manager of New Brunswick Power, d: "While the association has made orable progress in recent months in rking toward methods to improve public derstanding of the safety, security and nomy of nuclear power and of the role ust play in our expanding society, a at deal remains to be done."

He said the association had recently de known to the federal and provincial vernments its willingness to work with m in a joint public information program.

"What appears to be missing is a thod of rapid response to public infor- tion needs," the president said.

Mme. Jeanne Sauve, federal Minister of te for Science and Technology, said t Canada had not yet experienced the blems of fear and confrontation as had U.S. But she added: "The greater visi- ty of the program resulting from its cess and planned expansion will result increased interest as well as more ncern about financial, environmental safety implications."

Talking about the need for more public ucation, the minister said: "Fear can be t as real and maybe even more so when s based on a lack of information rather n a careful assessment of the facts and preciation of alternatives. It seems portant, therefore, that effective measures to counteract the bases for these fears should not be neglected."

S.G. Horton, manager of the Bruce nuclear project, described the community relations experiences and problems that had arisen. He said that skepticism over the nuclear program first started with the teething delays at the prototype Douglas Point nuclear station. Hydro was criticized for proceeding with the Pickering station before Douglas Point was proven. Subsequently, controversy arose over the Bruce heavy water plant and Hydro's consequent takeover of Inverhuron Park.

Mr. Horton, who co-authored the paper with Hydro public relations director J.J. Durand, said that the first public interest protest against nuclear power came only this year from a group called CANTDU. Members of this organization were not from the Bruce area, but 50 miles away.

"For the most part, people in the Bruce community have not shown any concerns about radiation or waste storage," Mr. Horton added.

Mr. Horton explained that despite public meetings, the influence of the CANTDU group is growing. "We shall undoubtedly hear more from them. Similar groups have been organized in the Maritimes and British Columbia."

He called for a renewed and reinvigorated information program to answer such anti-nuclear groups, whom he described as articulate and energetic.

"We should stress in the clearest and firmest manner possible the effectiveness of the Canadian safety procedures, precautions and standards laid down for Canadian reactors.

"It must be recognized that if any public participation is to be successful—and by successful I mean to the benefit of the total community—we must have responsible citizen involvement, sincere and meaningful utility involvement, as well as courageous governmental decisions. I believe the latter to be the most necessary ingredient. Without bold decisions on the part of the government to finalize the process, public participation in the planning process amounts to nothing but a lot of talk."

Simon E. Rippon, editor of a British publication Nuclear Engineering International, said there is a need to speed up and improve international communications on all the issues concerned with public acceptance of nuclear energy.

"I would like to see the establishment of some international clearing house for dealing with the questions of 'What are the critics saying and why are they wrong?' The U.S. Atomic Industrial Forum has set an excellent example and the Swiss Association for Atomic Energy has taken some of this work to Europe. But I would like to see other nuclear forums and nuclear associations around the world making a rather more determined effort to co-ordinate their experience in public information programs."

Standards stressed

While noting that public awareness is a major task facing the CNA, its outgoing president A.J. O'Connor also feels the industry must strive to become more competitive.

"Even a superb product like the Candu reactor can fall by the wayside if strong competitive forces are not provided to keep the industry sharp," he said. "In the past, the sheer task of keeping Candu alive provided that challenge. Now, in our moment of greatest success, the industry could face its greatest peril unless its products are competitive and economical, its quality high and its return on investment modest.

"Now is the time for proper compromise between product price and long-term industry viability." Mr. O'Connor stressed the need for continued research and development work with government co-operation and warned that the industry could suffer a shortage of skilled technical people.

"We must assure that the technical skills now existing are not sidetracked or wasted in work that is neither significant or timely."

J.M. Varughese, from Hydro's nuclear training centre, indicated that approximately 700 people will have to be recruited

each year between now and the year 2000 for nuclear operations.

"While the number does not seem large in relation to the total Canadian requirements for technically trained persons, nuclear operations will have to compete with other industries for suitably trained people," he said.

"Present trends in Canadian industry with regard to availability of personnel capable of being trained and retrained are not very promising. These trends are high turnover and mobility, shortages of skilled people in welding machinist and millwright trades, changes in attitudes toward work, a lack of national training programs in skills and trades."

Larry Woodhead, nuclear operations manager for Ontario Hydro, discussed Hydro's present nuclear operations and its future plans. He indicated the utility could have 25 million kilowatts of nuclear capacity installed by 1990. That would be between 65 and 70 per cent of the province's electrical energy at the time.

Conservation urged

The CNA has released a policy statement calling for more specific guidelines than those contained in the federal government report, "An Energy Policy for Canada."

The association's recommendations are to be made in a submission to the Minister of Energy, Mines and Resources.

While the association said it supported the general policy guidelines contained in the report released in June of 1973, it sees the need to conserve fossil fuels, especially oil and natural gas, for those applications where alternative sources of energy cannot be substituted. This would put more emphasis on nuclear power.

The CNA also feels specific attention should be directed to ensuring that security of energy supply for all regions of Canada is safeguarded, and incentives are provided to encourage its efficient use.

The policy statement calls for encouragement of interconnections interprovincially and between Canadian and U.S. electric utilities where there are mutual advantages in economy and security of supply.

It said environmental requirements should be established based on sound scientific and social principles. It also wants resource exploration and development to continue in such a way that energy industries are not inhibited because of foreign ownership restrictions.

H.A. Smith honored

The CNA took time out from its business sessions to single out Ontario Hydro's chief engineer, H.A. Smith, and honor him for his contributions to the nuclear industry.

Mr. Smith was named the first winner of the W.B. Lewis Medal. The medal and engraved certificate were established in 1973 to honor Dr. W.B. Lewis, senior vice-president (science) of Atomic Energy of Canada Limited until his retirement last year.

Dr. Lewis himself was on hand to make the presentation. Under terms of reference, the award is to recognize a Canadian scientist or engineer for technical competence and accomplishment in the field of nuclear science and engineering.

The award was presented because of Mr. Smith's involvement, encouragement and participation in the nuclear program.

After an early career with Hydro, Mr. Smith went to Chalk River in 1954 as engineer in charge of the Nuclear Power Group, a small body of Canadian industry engineers who collaborated with AECL on a study of the feasibility of developing natural uranium, heavy water-moderated reactors.

He was later involved in fostering the co-operative arrangement between Ontario Hydro and AECL which led to the Douglas Point prototype and, eventually, the Pickering and Bruce plants.

In accepting the award, Mr. Smith said the Canadian nuclear program owes a great deal of its success to unity of purpose and a highly competent nuclear team. "In accepting this award, I would like to think of it as a team award and that I have simply had the good fortune to receive it on behalf of the team."

H.A. Smith (left) accepts presentation from Dr. W.B. Lewis.





ise producer

conditioning equipment is the third nest noise producer in the community r aircraft and surface transport, and ess manufacturers lower the noise lev- of their products they will be unable to rket them, says Aubrey Edwards, noise l vibration engineer with Ontario Hydro.

Mr. Edwards told the annual conference he Heating, Refrigerating and Air- ditioning Institute of Canada that regu- ons will soon be introduced by the ario Ministry of the Environment to con- noise levels in the community. The ropriate legislation has already been roved by the Ontario government.

'This legislation will have important lications for the air-conditioning indus- ," said Mr. Edwards, who heads up an oc committee appointed by the insti- to study noise levels.

Starting January 1, 1975, the Committee ecommending to the air-conditioning ustry a maximum permissible noise el, measured at the lot line, of 55 dBA (a ghted noise level in decibels) during day and at night. Research has shown, added, that typical residential air- conditioning equipment at present has a se level in the range of 60 dBA.

Mr. Edwards said that in 1977 there will a further recommended reduction in se levels to 50 dBA during the day and at night. Looking to the end of the dec- , he predicted that equipment will have neet a night noise level of 40 dBA. The istry of the Environment has yet to say at noise levels it considers acceptable.

Mr. Edwards said the recommended 4 noise levels should not be hard to t. He suggested the installation of two- ed fans for day and night use which reduce noise levels by as much as five even decibels and, in critical locations, installation of simple barriers around outside of the unit.

But the levels for 1977 mean manufac- rs will be required to undertake a great deal of development in the next three years, Mr. Edwards said.

He predicted that in the next five years between 50 and 70 per cent of all homes in Toronto will have air-conditioning installed.

Ray Pfaff retires



One last time

When W. Ray Pfaff joined St. Catharines PUC as manager in 1948 he had already made many friends in the municipal utility field. In the 26 years that followed he made a great many more, and they turned out recently to attend Mr. Pfaff's retirement banquet.

Mr. Pfaff began his career as a lineman and plant operator in Delhi in 1931. He subsequently became manager of the Delhi Light and Power Co. before moving on to Niagara-on-the-Lake in 1941 and to St. Marys four years later.

During his career, he's seen two major changes in electrical frequency. When he was is Delhi, the conversion was from 60 to 25-cycle power. Shortly after his arrival in St. Catharines, the situation was reversed.

One of the foremost problems Mr. Pfaff faced after taking over in St. Catharines was a reduction in the city's electric energy quota due to a post-war power shortage. His suggestions, along with the co-operation of local industry, were credited with avoiding power cuts or brown-outs in the city during this critical period.

But Mr. Pfaff never forgot his early working days as a lineman — a fact evident at his retirement celebration when he was hoisted 50 feet in the air by one of the utility's bucket trucks. He even donned a hard hat and insulated gloves for the occasion.

During his career, Mr. Pfaff has served on many AMEU committees and was 1959-60 president of the association. He has also served as president of the former Electric Heating Association and is a past president of the Electrical Utilities Safety Association.

Rate hike sought

The Ontario Energy Board is reviewing an Ontario Hydro application for an increase in the wholesale rate of power of about 15 per cent for 1975.

Public hearings on the application opened June 10.

The increase would be passed along to the municipal utilities, who buy bulk power from Ontario Hydro and in turn supply the majority of the province's 2.5 million users. Annual increases of 10 to 15 per cent are expected throughout the period 1975 to 1979.

For large industrial users served directly by Ontario Hydro, an increase of about 16 per cent is proposed for 1975. This rate also provides for recovery, over a five-year period, of deficits outstanding against the direct industrial customers at the end of 1973.

Rates for about 680,000 rural customers who receive power directly from Ontario Hydro were to be announced later.

In its February 28 written submission related to the Energy Board's review of Hydro's financial policies and objectives, Hydro presented three alternative financial programs, but later indicated its preference for continuation of the 1974 program.

The three plans presented to the board illustrated Hydro's concern with the balance between what is being paid by customers and what is being borrowed.

Hydro is recommending the continuation of the system expansion

charge in the cost of power at the 1974 rate. It recognized in its submission that with heavy capital commitments for the future such a charge might reasonably have been increased. However, it was felt by Hydro that the adoption of a higher level of charges would result in an unacceptably high rate increase.

Escalation of salaries and wages, interest rates and prices for fuel, materials, equipment and property, along with the need to expand the system to serve Ontario, are the main factors underlying the proposed increases.

Fundy power feasible

Development of the Bay of Fundy tides is technically feasible, financially practical "and will happen a lot sooner than many people imagine," says British financier Edmund de Rothschild.

He told the Halifax Board of Trade that the economics of the $2 billion proposal have been enhanced by recent increases in the cost of competitive energy forms.

Development of the tidal power resource between Nova Scotia and New Brunswick has been discussed for many years and is now being reviewed by a joint federal-provincial study group and a body commissioned by Mr. de Rothschild.

He says the economics of the project have been improved by significant technical advances in the storage and transmission of energy and in the fabrication of the kind of structures needed to control the waters of three principal sites on the Bay of Fundy.

Mr. de Rothschild, who is chairman of N.M. Rothschild and Sons Ltd. and a prime mover in the $960 million Churchill Falls hydro-electric development in Labrador, says the government study will be crucial in determining if and when the project is developed.

Because of the long construction and development time involved, he thinks it is unrealistic to expect tidal power before the 1990's, but the project is nearer to reality than many people imagine.

While he spoke only in generalities about costs and output, Mr. de Rothschild mentioned 10 million kilowatts as the bay's likely power potential and estimated the cost of power produced would range midway between nuclear and fossil-fuelled generation.

He said the economics of the scheme have changed dramatically since the original study suggested that is was impractical. Fuel oil prices, he said, are now five times what they were in 1971.

"The situation is changed so much that it looks as if there is more of a chance of developing the tides than has ever presented itself before," Mr. de Rothschild added.

Beginning a new career



Reg Turton

Reg Turton, 57-year-old Welland Hydro manager, is giving up his 29-year utility career to enter the ministry.

Mr. Turton submitted his resignation to the Welland commission, announcing that he has been accepted into the residential course at Toronto Baptist Seminary.

He said his decision was "an answer to the Lord's call" and that he felt there was much work to be done in the ministry. "I've been giving this consideration for a number of years," he said, "and started to take seminary courses before I finished exams for engineering."

Born in England, Mr. Turton started as handyman in 1945 with Sarnia Hydro. He moved to Welland in 1961 when he was appointed general manager.

Mr. Turton is a member of the Institute of Electrical and Electronics Engineers a is a past chairman of the Niagara international section of the IEEE. He is also a member of the Gideons and has preache in a number of churches.

Plea for better insulation

Organizations representing the energy industry in Canada have joined forces in conservation bid aimed at upgrading ins lation standards for residential construc tion.

The oil, gas and electric industries ar seeking changes in the National Buildin Code which could result in energy savin of about 37 per cent in new homes. The want the changes incorporated in a revi national code due to be published in 19

A decision on the request was expec from the Associate Committee of the National Building Code this July.

The appeal for better insulation was made in a brief submitted to the commit by a joint energy industry task force headed by C.E. Rickards, of the Canadi Gas Association, and W.L. Scott, techni services engineer in Ontario Hydro's sa division.

Other organizations involved are the Canadian Electrical Association, the Ontario Petroleum Association, the Que bec Petroleum Association and the Oil Heating Association of British Columbi

"All segments of the energy industry feel so strongly about conservation tha they established this united front," said Scott.

Appeals have also gone out to the 1 provincial governments, the prime mini and other political figures for support.

"Because of the increasing need fo efficient utilization of Canada's non-

ewable energy resources and the esca-
ng cost of all forms of energy, the oil,
, and electrical industries believe that it
ssential, and in the national interest, to
serve energy used in the heating of
dences," the brief states.
'Energy consumed in buildings classi-
for residential occupancy accounts for
gnificant portion of all energy con-
ption in Canada. Energy reduction
n residences could be redirected to
ustrial applications to strengthen the
nomic well-being of the country," the
f continues.
At present, the National Building Code
s only that homes should have suffi-
nt thermal insulation to prevent mois-
condensation on walls, ceilings and
rs during winter.
Central Mortgage and Housing Corpora-
n has its own suggested minimum
uirements for insulation. Mr. Scott says
joint industry task force wants insula-
n standards to be more than doubled
n the existing CMHC minimums and
nts them to be mandatory.
While the brief specifies insulation, it
b suggests that aspects such as window
es and glazing, heat-recovery systems
n waste water and exhaust air, solar
reening to reduce cooling load and con-
led ventilation methods should eventu-
l be considered.

Uranium pacts

Canadian uranium producers Denison
Mines Ltd. and Rio Algom Mines Ltd. have
signed long-term contracts for the sale of
uranium off-shore.
Denison Mines has signed a formal
agreement with Tokyo Electric Power Co.
under which the company will ship 40 mil-
lion pounds of uranium oxide to Japan
over a 10-year period beginning in 1984.
Believed to be the largest private sale of
uranium ever negotiated, the contract is
currently estimated to be worth $800 mil-
lion. It calls for an advance payment of $10
million to meet mine expansion costs asso-
ciated with meeting the contract prod-
uction date.

The Rio Algom Mines deal is a 10-year contract for the sale of 20 million pounds of uranium oxide to British Nuclear Fuels Ltd., beginning in 1982. At projected uranium prices, the contract is valued at about $400 million.

Deliveries are to be made at a rate of two million pounds a year running through 1992.

Diamond jubilee



Commemorative plaque

Former Clinton PUC manager Jabez Rands returned recently to the office he had occupied for more than 40 years to unveil a plaque commemorating the utility's diamond jubilee.

Helping Mr. Rands to unveil the plaque were incumbent manager Gus Boussey, PUC chairman Hal Hartley and Ontario Hydro's Western regional manager George Currie.

In a tribute to the utility, Mr. Currie said that "if only one word could be used to describe Clinton PUC, that word is stability.

"Stability of the people involved is what I mean," he said. "When you consider how the town council and the PUC withstood the shock of having the largest armed forces base in Southwestern Ontario established on its doorstep in 1941, you can't help but be impressed with the resilience of Clinton's economy and the progressive attitudes in meeting this challenge."

Paying tribute to commissioners, both past and present, Mr. Currie said that utilities can expect to be exposed to controversy on a wide range of issues in the future, including development plans that at one time might have been more universally welcomed.

Green acres

The old Gatineau right-of-way is taking on a new look in Scarborough and East York. So is the Finch right-of-way in North York and the Richview right-of-way in Etobicoke.

The boroughs have set up garden plots along the transmission line routes and they're offered on a first-come, first-served basis. Demand from green-thumbed residents is apparently heavy.

The 10 by 20-foot plots are being plowed and maintained by the municipal works departments. All the lessee has to do is the planting and reap the harvest when the time comes.

Permitting the planting of vegetable gardens on transmission line rights-of-way is part of Ontario Hydro's new multiple-use policy. At present, there are two garden plot areas in North York, two in Etobicoke and one each in East York and Scarborough.

Each garden is fenced by the municipality and irrigation facilities are being installed.

Big bang

The Soviet Union has announced plans for the world's largest conventional explosion to create the dam for a major hydro-electric project in a remote river gorge in Central Asia.

Descriptions of the proposed experiment in the Soviet press suggest it will produce 25 times the explosive power of the atomic bomb at Hiroshima in 1945.

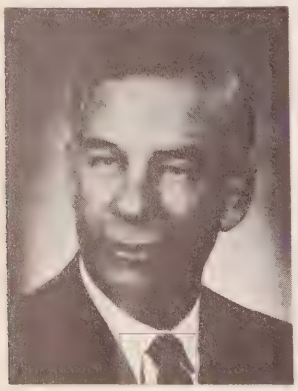
The Russians plan to create a granite rock dam 1,000 feet high and nearly two miles long in a matter of minutes through a

series of carefully co-ordinated explosions set off with split-second timing.

No date for the big blast, expected to require 500,000 tons of explosives, has been announced, but it is believed to be planned for around 1980.

The biggest detonations in the United States have involved 2,000 tons of explosives, says an official of du Pont de Nemours & Co., the largest civilian manufacturer of explosives. The official said such charges were set off in 1972 and 1973 in Arizona to shatter copper-ore bodies so they could be mined in place by a leaching process.

Labor leader on board



William Dodge

William Dodge, 62-year-old Ottawa labor leader, has been appointed the 13th member of the Ontario Hydro board of directors.

The appointment was announced by Premier William Davis and is for a three-year period.

Mr. Dodge, who was elected secretary-treasurer of the Canadian Labor Congress in May, 1968, has announced he will take early retirement to sit on the Hydro board.

He is a member of the Canadian Manpower and Immigration Committee, the Canadian Economic Policy Committee, the Canadian-American Committee, the British North American Committee and the Canadian Social Development Council.

He was appointed to the Committee on University Affairs of Ontario in 1969.

Starting his career as a railway worker, Mr. Dodge joined the Canadian Brotherhood of Railway Transport and General Workers in 1930, holding various offices in that union for 20 years.

During the Second World War he served overseas as a lieutenant in the Royal Canadian Artillery. He obtained his B.A. degree in 1949, majoring in economics, while on leave from Canadian National Railways. In 1955, he was named general representative of the Canadian Brotherhood of Railway and Transport Workers for Quebec. He served several terms as vice-president of the Montreal Labor Council and was a member of the executive commission of the Quebec Federation of Labor in 1957 and 1958.

Mr. Dodge was born at Verdun, Quebec, is bilingual, married and lives in Ottawa.

Emphasis on coal

The U.S. Interior Department has revealed a five-year, $4.6 billion research program aimed at shifting the nation's energy base from oil and natural gas toward coal.

The department's plan would represent about half of President Richard Nixon's proposed $10 billion energy research program, whose other major feature would be development of the nuclear fast breeder reactor by the Atomic Energy Commission.

Interior Secretary Rogers Morton says his department's energy research could range from $3 billion to $5 billion over the five years from 1975 to 1979, depending on how economically its various projects can be achieved.

Mr. Morton has, however, issued a 274-page book detailing a program with a five-year price tag of $4.6 billion.

Of that total, more than $3.47 billion would be designated for research on the mining of coal and its conversion into oil or gas.

Coal conversion would not develop new energy resources, but would convert coal into liquid and gas forms that would be cleaner and easier to use and could substitute for natural oil and gas.

"This is not new energy in a sense," Morton says, "but energy that would mo the centre of gravity away from petroleu toward coal, which better fits the resour in the ground."

U.S. coal reserves are huge in compa son with its oil and gas reserves.

municipal briefs

Peterborough Utilities Commission has taken out a full-page advertisement in th Peterborough Weekly Review to presen 1973 annual report to its customers. Th ad features two silver dollars labelled "r enue" to show where the money comes from, and "expenditure", to show wher the money goes. It also supplies informa tion on all departments of the utility and contains a financial statement.

It's just a coincidence but when Robert Cross, recently retired as line superinte ent with Simcoe PUC, began his trade training 44 years ago he was taught by man named Ed Smith. Mr. Cross has no stepped down...his replacement is a ma named Ed Smith.

Etobicoke Controller Bruce Sinclair ha called for the borough's water departm and Etobicoke Hydro to combine their meter-reading brigades to enable one to read both meters in every house in th borough. Mr. Sinclair made the propos a works committee meeting after heari water department budget item calling f $125,000 for meter reading.

The 101,000 inhabitants of East York, Metro Toronto's smallest borough, are the midst of a year-long series of activi to commemorate the municipality's 50 anniversary. A long-standing opponen amalgamation proposals, East York pu off a merger of its own in 1967 when th former town of Leaside became part o borough.

Hydro news

September/October, 1974

UNIVERSITY OF TORONTO

The commodities crunch



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Paul Page, Design Direction
Bill Flett, Design

the cover

Base metals, wood, oil . . . you name it, have not only skyrocketed in price in the past year but have been difficult to obtain. How the world commodities shortage has affected Ontario Hydro is explained in the article starting on page five.

Cover photo: Harry Wilson

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hydro news, volume 61, number 5

Published by Ontario Hydro, 620 University Ave., Toronto
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Printed in Canada

The Conservation Ethic

Recognizing its responsibilities in helping to achieve the optimum use of energy, Ontario Hydro has committed itself to a more aggressive policy in the promotion of the voluntary conservation of energy.

Most everyone will agree that energy conservation is essential now that our resources have been recognized as being something far less than limitless. Not fully appreciated are the complexities involved in applying the conservation ethic to the supply and distribution of energy which is deeply woven into the full fabric of our society.

Some of the factors Hydro will keep in the forefront of its thinking in developing a more aggressive approach to conservation were discussed by Board Chairman George Gathercole in an address to the Institute of Power Engineers earlier this year. The full text of his remarks commences on page 19 of this issue.

Fortunately, a good deal can be done towards conserving energy without drastic sacrifice to our lifestyle, and this is essentially the parameter within which Hydro will confine itself at this point in time. It is a finely-tuned approach with the emphasis on the wise and efficient use of electricity rather than a heavy-handed, across-the-board attempt to discourage consumption.

This is not merely an attempt by Hydro to pay lip service to conservation through a highly visible advertising program. With its expertise and resources, Hydro is in a very favorable position to assist its customers in making efficient use of electricity. And that's what it's doing.

"Hydro can *tell* its customers to conserve electricity," Mr. Gathercole points out, "but in my view its major role is to *show* them how this can be done to their advantage." The means Hydro is employing include research in applications and technology, promotion of improved standards of insulation, analysis of rate structures and off-peak energy use, seminars and training programs for industry, and customer information.

Not apparent to many of the public, who tend to see energy conservation in simple terms of black and white, is the ripple effect which can be generated by inducing change in the consumption pattern.

Reduced consumption over the short term can result in higher unit costs since utility revenue tends to decline faster than costs. This is happening in the United States and, as Mr. Gathercole points out, customers who have voluntarily cut consumption to help their country through an energy crisis become very angry when they have to pay for their patriotism through higher electricity bills.

Some of the U.S. utilities are also finding that much of the reduced use of power is taking place in off-peak periods — again adversely affecting unit costs.

And there is the question of credibility in equating Hydro's vast system expansion plans with the conservation ethic.

There has been criticism that the expansion program presupposes a rate of growth which is not consistent with the new emphasis on conservation.

This apparent paradox can be explained in terms of the long-term trend. Electricity now accounts for less than one quarter of all energy used and it has been estimated that by the year 2000 it could represent at least one-half of all energy requirements.

Many believe this shift towards electricity, nuclear power in particular, is both desirable and inevitable as a means of reducing pollution at the point of use and husbanding fossil fuels for other high-priority uses such as transportation and the petro-chemical industry. It will be important not to misinterpret this trend as a lack of success in promoting conservation and the wise and efficient use of electricity.

Adequate electrical supplies cannot be jeopardized by over-reaction to any short-term shift in the demand pattern occasioned by conservation measures or downturns in the economy.

Hydro has an important responsibility in assisting its customers to make the best use of electricity. And there are many effective measures being implemented towards this end. But as the Hydro chairman points out: "The role of utilities such as Ontario Hydro in energy conservation, as far as public opinion is concerned, can be summed up in one word: 'difficult'. Or two words, 'damned difficult'." □

Power pack that went to the moon

by Sheila Kenyon



ontrary to popular thought, the fuel cell is othing new. Its principles were discovered in 339. But only now is the fuel cell being recognized an extremely efficient energy conversion device.

Unique electric generator has been alled at Hydro-Quebec's service centre the Boulevard de la Canardiere in Que- City. It has virtually no moving parts is almost noiseless and pollution-free. n fact, a Hydro-Quebec research team hooked a propane gas fuel cell into the vincial grid to determine the practicality electric utilities of this space-age energy nversion device. Actually a bank of six l cells yielding a modest total of 75 kilo- ts, the power package has been operat- on an experimental basis for about a r.

Hydro-Quebec is understandably cau- s about the fuel cell's potential. It is no acea, they feel, but an energy conver- n system that in specific cases can com- e favorably with others.

Hydro-Quebec's Powercel 11 modules e built by the Pratt & Whitney Aircraft sion of the United Aircraft Corporation. Manwhile, Pratt and Whitney has joined es with nine major U.S. electric utilities n' $42 million program to develop a large- le fuel cell capable of generating 26,- 0 kilowatts.

Designated the FCG-1, the fuel cell uld be about 18 feet high and could be ated on less than a half acre of land. It uld provide enough electricity to meet needs of approximately 20,000 con- ers. Provisional orders have already n placed by the nine utilities.

t all adds up to a flurry of activity in the ght world of exotic power research to elop what Fortune magazine has called tentially the most efficient of all power rces." While based on an exceedingly tle and complex electrochemical reac- even now not completely understood, fuel cell has the attractive attribute of ng, in principle, an extremely efficient rgy conversion device.

The efforts of two Englishmen and the etus of the U.S. space program can e credit for bringing the fuel cell to its rsent stage of development. The princi- of the fuel cell — the direct conversion he reaction between hydrogen and oxy- e into electricity — was first discovered Sir William Grove in 1839.

Sir William, a judge and scientist, was exploring electrolysis of water into hydrogen and oxygen. When he reversed the process and brought oxygen and hydrogen together in a controlled way on catalytic platinum electrodes, water was formed. In the course of the reaction, an electric current was produced. The fuel cell was born.

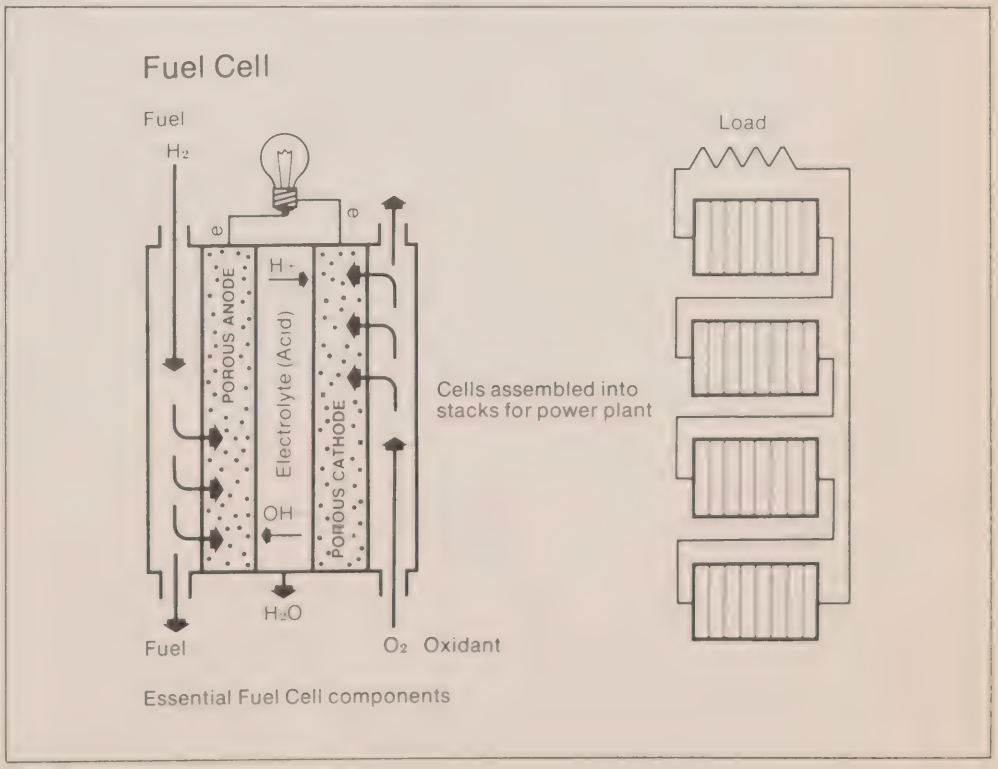
Sir William reported his findings merely as a postscript to a letter published in the Philosophical Magazine and Journal of Science. But significance of his observation passed unnoticed in a world of oil lamps and coal stoves.

One of the best definitions of the complicated electrochemical reaction is given by A.A. Stodalka, superintendent of measurement, Canadian Western Natural Gas Company Limited, of Calgary. He describes the fuel cell as "a device which can transform hydrogen and oxygen into electric power through an electrochemical reaction, without combustion."

In the fuel cell, the electrodes provide a site for electrochemical reaction to take place as fuel in the form of hydrogen, natural gas or propane is supplied to it. Direct current is produced and this can be changed to alternating current by an inverter.

Recent research has concentrated on inexpensive materials for use as electrodes, perfecting the inverter and the design of a fuel cell that could operate efficiently on hydrocarbons. The U.S. space program with its vast availability of research dollars was the key factor to concentrated development. Russia, France, Germany, Britain and several other countries have also been involved in fuel-cell research.

The space program called for a fuel cell to supply power to spacecraft together with water for drinking and cooling purposes. Pratt & Whitney undertook the research for the Apollo program using a



Essential Fuel Cell components

fuel cell based on the Bacon cell developed by Bacon at Cambridge University. The company obtained the rights to the Bacon cell in 1959 after Bacon had spent more than a quarter of a century developing a 5-kW hydrogen-oxygen power source.

Fuel cells developed for the Apollo program had guaranteed lives of more than 1,000 hours. The power package used hydrogen and oxygen in a potassium hydroxide electrolyte. It provided 2,000 watts for guidance and communication functions of both the command and service modules of the manned spacecraft. Water for drinking and cooling was produced as a by-product.

According to Canadian Petroleum magazine, "the expensive platinum catalyst used on the (Apollo fuel cell) electrodes and the pure hydrogen and oxygen fuel ruled out the possibility of conventional commercial application."

While the space program was boosting development of the fuel cell, a number of gas companies joined forces in 1967 to create TARGET (Team to Advance Research for Gas Energy Transformation).

Pratt & Whitney is also a member of this group, dedicated to the development of a new energy service offering thermal and electrical needs by natural gas.

Today, TARGET is supported financially by 33 North American gas companies. The only Canadian member of the group is Canadian Western Natural Gas Company, of Calgary.

TARGET established a three-phase development program aimed at producing an economical fuel cell. At the same time, marketing possibilities and the needs of potential clients are being studied. During the program, lower-cost components have been developed resulting in significant cost reductions. Parts are designed to ensure adaptability to mass production.

TARGET's phase two program consists of the testing of fuel cells in homes, apartments, stores, banks offices and industrial plants.

Two installations at substations demonstrated fuel cell power plants operating in parallel with an existing electric distribution system.

Canadian Western Natural Gas took part in the testing of Powercel 11 in 1972. The fuel cell, slightly larger in size than a washer and dryer combination, was installed in a home in Calgary. Over the test period, Powercel provided complete electric power to the home. Results of the experimental program will be available shortly.

Commenting in an article in "Propane Canada", the company sees the fuel cell as "potentially the most efficient electrical generator using fossil fuels." It was estimated that the fuel cell would consume about 25 per cent less fuel than conventional thermal-electric generators.

The significance of this is illustrated by the amount of natural gas used during 1971 by the City of Edmonton's thermal plants. A saving of 25 per cent would represent the amount of gas required to heat 29,000 single-family homes for a year.

Energy transmission costs could be reduced by locating fuel cells at major load centres, it being cheaper to pipe gaseous fuel into cities rather than transmit electricity over high-voltage underground cable. The fuel cell can also operate on tanks of propane, which makes it useful in remote areas and for use by the armed forces.

In an era of fuel conservation and environmental control, the fuel cell offers many positive attributes. According to Canadian chemist B.E. Conway, of the chemistry department of the University of Ottawa, and A.K. Vijh, of Hydro-Quebec Research Institute, it provides a source of power with many desirable qualities: no atmospheric pollution, no thermal effects on rivers and lakes, no noise pollution, no moving parts.

Improved production and technology should eventually bring the cost of fuel cells down. However, Conway and Vijh warn: "It is clear that for ordinary terrestial uses, the present cost of energy generated by present fuel-cell systems is prohibitively high and will remain so for several years."

Jim Clark, a Toronto man who has spent 40 years working in gas chemistry and designed the fuel cell at the Ontario Science Centre, believes the fuel cell must b based squarely on economics. "If the fu cell costs more than alternative power, it won't be used." he says. "Further, the ki of fuel used will depend on circumstanc in different areas."

Where gas is inexpensive and electri costly, the fuel cell may become practica ble to produce cheaper electricity. By 1980, for example, Hydro-Quebec believ it might be economically feasible to sup remote communities by fuel cell rather than by diesel-engined generators.

In other circumstances, hydrogen ma be used to feed fuel cells of the future. Bacon has proposed a grid of hydrogen pipes — rather like natural gas pipeline present — to serve small fuel cells servi specific communities.

Some day, it is suggested, our ocear and lakes could provide hydrogen sepa rated from the water by nuclear energy.

In 1839, when Sir William Grove exp mented with electrolysis, he could hard conceive where the results would lead. the true potential of the fuel cell has stil be assessed, and it may be decades be it is fully developed. □

Like Old Mother Hubbard...

. electric utilities have been hard hit by the shortage
f basic commodities. "If it's not in short
ıpply, we don't use it," says one executive.

Rae Hopkins



Empty cable reels dominate this storage area at the Ontario Hydro Service Centre in Toronto

There was a time — not too long ago — when industrial salesmen would do just about anything to woo potential buyers. But not now.

Indeed, it's become a sellers' market and it's the salesmen who are being wooed by purchasing agents the world over to line up the materials needed to keep their companies in business.

This reversal in trend is attributed to a world-wide material shortage that runs the gamut from oil to steel and toilet tissue.

Shortages are hurting just about everyone. The electrical manufacturing industry is no exception. Neither are the utilities.

In a recent speech to the Electric Club of Montreal, W.L. Hetherington, president of Ferranti-Packard Limited and a director of the Canadian Electrical Manufacturers Association, said the energy crisis has catapulted the nation from a demand economy to a supply economy overnight.

He said that only months before he was concerned primarily with market forecasts, market participation and the volume of business.

"Today," said Mr. Hetherington, "I'm primarily concerned with shortages. Where will the resources come from to build the products which utilities and other customers are ordering?"

About the end of last year, Mr. Hetherington became personally involved in a shortage of transformer oil within his company, although signs of a general materials shortage began to show up about mid-1973.

He says the possibility of a shortage never occurred to Ferranti-Packard officials until one of the suppliers announced a drastic reduction in commitments and another was unable to increase transformer oil sales to the company.

Suddenly, Mr. Hetherington found himself in the role of arbitrator, establishing priorities for use and co-ordinating a world-wide search for alternative sources of supply.

"I didn't get to the stage of carrying oil back and forth in the trunk of my car between transformer plants in Toronto, St. Catharines and Trois-Rivieres — but I came close to it," he says.

At Ontario Hydro, a world-wide search for materials, particularly steel, transformer oil, and transformers, is becoming part of the day-to-day routine.

Jim Wilson, of Hydro's supply division, says personnel are in constant touch with steel mills around the world, trying to buy the estimated 850,000 tons of steel Hydro will require in the next three to five years.

(In 1970, the world used 700 million tons of steel. Next year the demand will reach close to 850 million tons.)

So bad is the situation, he says, that of 16 steel mills throughout the world contacted about an order for steel plate worth around $10 million, replies were received from only three and one — a Canadian producer — could not make a firm commitment.

Ontario Hydro faces stiff competition in the steel market from other energy-related projects such as the Syncrude tar sands scheme, the Texaco refinery at Nanticoke, the Petrosar petrochemical project and Atomic Energy of Canada Limited.

"Indeed, we're in a leg race with other agencies to ensure that Ontario Hydro's needs are met to protect our schedules" Mr. Wilson says.

He points out that demand for steel in Canada is now well over production capacity. In addition, steel production in the nation over the short term is hampered by a shortage of scrap together with the shutdown of several blast furnaces for routine maintenance and overhaul.

One of the hardest-to-obtain items on Hydro's shopping list is quality castings for nuclear station pumps and valves. There is a severe world-wide shortage compounded by increasing demand, decreasing supply and a lack of skilled labor.

The inability to obtain castings is also a spill-over from the U.S. energy program where many utilities were forced to switch from oil to coal in thermal-electric stations because of the Middle East oil embargo.

With the switch in fuels, utilities are making excessive demands on foundries for grinding mills that reduce coal to a fine powder. "U.S. companies are attempting overcome the shortfall by purchasing the needed castings in Canada," Mr. Wilson says.

Philip Stratton, Hydro's assistant director of supply — services, says the proble is compounded by the fact that nowaday no one wants to work in a foundry. "We' living in a clean hands society and work generally don't want to get their hands d if they can help it."

Distribution transformers, too, are ab as scarce as hens' teeth. With Canadian suppliers operating at peak capacity an deliveries stretched far out, Hydro has h to place an order in the U.S. to meet its present needs.

Older re-useable models are not beir scrapped any more, but put into storage for possible rebuilding at higher costs th for new equipment. But, as Mr. Stratton points out, new equipment just isn't ava ble.

The critical situation is restricted nei to Hydro nor to oil or steel. It's a world-wide phenomenon and takes in such co modities as wood, aluminum, copper, ir plastic products and a variety of specia goods ranging from paper to ammoniur nitrate for blasting.

Says one U.S. utility executive; "If it's n in short supply, we don't use it."

Municipal utilities, too, are suffering from the shortage syndrome, so much s that in Windsor line crews are lashing w out wood poles to the stumps of others to prolong their lifetime. New wood pol are almost non-existent.

In Waterloo, private contractors hav been hit with a shortage of electrical su plies so serious that Waterloo Hydro m ager Ivan Bradley fears construction m be affected in the next few months.

Electrical service to three apartmen buildings and four commercial projects already been held up by a parts shorta

Mr. Bradley says that in each case t delays were due to private electricians being able to complete the interior wor "But it reflects what's happening in the electrical trades," he adds.

At North York Hydro, management stated it may be necessary to improvis



with various materials on hand in order to supply new customers. An example would be the use of pole top rather than underground transformers.

Last fall, the utility set up a steering committee to deal with the shortage problem. Its recommendation was to order material for at least a year's use at a time and set up an allocation system.

The net effect, hopefully, was to enable the utility to specify in-service dates to customers with some degree of certainty.

Earlier this year, Ontario Hydro's regional managers were advised to hold off on extending service to summer cottages, overhead to underground line conversions for aesthetic reasons have been cancelled, there will be no more pole rentals for sentry light purposes and the rural pole replacement program has been set aside because of the chronic shortage of materials.

Doug Code, a rural service superintendent appointed co-ordinator of a province-wide materials allocation program, says people applying for electrical service for summer cottages are advised of the materials shortages and told Hydro can't make any promises as to when service may be available. (Mr. Code has since been named marketing manager in Hydro's Northwestern region).

"Area offices simply take their number and tell them they'll be called when service can be provided," Mr. Code says.

Area office line crews take core samplings of rural poles every summer to judge the useful life of a wood pole and slate a replacement date for ones which show signs of deterioration.

However, Mr. Code says, replacements will be held off until the situation improves. "If a pole is standing it will stay there." Mr. Code attributes much of the wood-pole shortage to the high price finished lumber is bringing. Lumber producers just are not sorting pole-quality timber any more.

Because low-profile, pad-mounted transformers are in such critical supply, transmission and distribution personnel are trying to devise ways of using pole-mounted transformers on a pad. However, some way of keeping the public away from the terminal has yet to be found.

The materials shortage has caused Hydro's supply division to alter its procedures to allow for the longer lead time demanded. And the lead time for many items has doubled and in some cases tripled.

The day of the firm price and delivery date is a thing of the past, says Jim McInerney, manager of procurement — general products. Suppliers now quote prices at the time of delivery, not at the time of placing the order.

Jim Moull, manager of procurement — electrical products, says that in the past most companies would quote a firm price for periods of up to two years. "But now, in most cases, escalation clauses are built in to tender prices.

"Many suppliers, as with the rest of the people in today's economy, are finding it difficult to supply goods at originally agreed-upon prices — but most are able to fulfill the original contract agreement," he says.

To obtain cable for the proposed 500-kV network that will link new generating stations into the provincial grid, Hydro is offering to provide several producers with the aluminum from which the cable is fashioned, Mr. Moull adds.

How does one cope with the present crisis? Ferranti-Packard president W.L. Hetherington stresses versatility and flexibility. Engineering and manufacturing departments must be ready to substitute when certain materials run short — and this cannot be done overnight, he says.

"Reliability must always be maintained and substitutions must be with equally reliable materials. This often takes a good deal of searching and testing, but there is usually another way and often the other way is better than the usual way."

A long-term shortage of basic materials will cause a shift in design criteria.

Transformers, for example, have been designed for many years to lose very little current. But Mr. Hetherington predicts this will change in favor of high-loss transformers with consequent savings of steel, copper and aluminum. The shortage of transformer oil is already forcing changes in the mechanical design of tanks and cooling systems to minimize the quantity oil required.

Mr. Hetherington says that, in a supply economy, service becomes more important than sales. The sales force must see that its customers know the problems ma ufacturing is facing so that they can adju specifications and extend lead times.

But he warns that both purchasers an suppliers must act responsibly to avoid creating artificial shortages through pani buying.

"I'm afraid panic buying has been hap pening and is probably the main reason f most material shortages today. It could create serious problems in the economy later on if suppliers make decisions to expand manufacturing facilities based o these artificial shortages alone without a careful analysis of long-term markets."

Another strong advocate of substituti is Mr. Stratton. He suggests, for example that pre-stressed concrete be used as a substitute for steel. He points out there i yet no shortage of concrete. "At least, it easier to get delivery of concrete than it steel."

However, he feels that panic buying i symptom — not the cause — of materia shortages. Rather, he puts it down to an inconsistent economy. "People concern with the procurement of materials are, in effect, trying to forecast economic trend of the country and, indeed, of the world.

Mr. Stratton told an Association of Municipal Electrical Utilities district mee ing in May that "when utilities feel aggrieved or frustrated about material shortages and inflation (he insists the tw go hand-in-hand) I sometimes feel that we've forgotten the fundamental tenet o our so-called free enterprise system: Su cessful commercial enterprise is achiev through exploitation of the marketplace maximize return on investment to the ow ers of the enterprise.

"However, in today's largely manage as distinct from free — marketplace, th frequently means regulating supplies to maintain a shortfall of demand, thereby

ndsor Utilities Commission is providing its vn solution to the wood-pole shortage. Poles rmally rot away just below ground level. e utility is discarding the rotten sections and shing the sound ones together.



ducing price hikes and deferring sales ith the expectation of increased profits om spiralling inflation.

"Since the consumer has every induce- ent to buy and hoard in the expectation at whatever he or she buys today will obably cost more in constant dollar rms tomorrow, we have all the ingredi- nts for runaway inflation leading to an onomic bust," Mr. Stratton says.

In fact, financial consultant and writer ax Shapiro, in a recent article in Dun's agazine, predicted this situation would cur in the U.S. about 1981.

Shortages of some commodities, espe- ally steel, are expected to be prevalent to the 1980's.

"There are only a few options left for tional governments to prevent it and all e politically unpalatable, if not impossi- le. They have to call a halt to increasing e money supply now running at unprece- nted peace-time rates of between 10 d 20 per cent annually. They have to rb credit to consumers and speculators. ey have to cut deeply into government ending which is also escalating in con- ant dollar terms by more than 10 per cent year," Mr. Stratton says.

But, he adds, if such action was taken ultilaterally by the Western nations, all e material shortage problems would be er tout de suite. Supply would soon out- rip demand and salesmen would be win- g and dining customers again instead of ce-versa.

"The only catch is that unemployment uld be in double figures and public serv- es, including Hydro, would be cut to ssentials," Mr. Stratton says.

And Bill Olinoski, Hydro's manager of pply control, in somewhat of a reflective ood, questions just how much the Viet- m war had to do with the materials short- ge.

"When you think of the billions of tons materials that were wasted...." □

Utilities await the word

Change is definitely on the way for municipal utilities in regional government areas. The questions are when and how.

by Bill Settatree



Morley Watson... twice had to move.

Morley Watson is beginning to feel jinxed.

The manager of Bowmanville PUC is facing a problem common to dozens of other municipal utility managers across the province — his future is uncertain because of regional government and the planned restructuring of utilities.

But Morley has been displaced twice before: once when a portion of Ontario Hydro's London rural operating area was taken over by London PUC; the second time when 80 per cent of Sandwich West Township was acquired by Windsor Utilities Commission.

Each time, though, he's bettered himself and he's confident that under a restructured utility system there'll still be work for everyone.

"All I can say is here we go again," Mr. Watson said as he leaned back in his office chair, his hands cupped behind his head. "I like Bowmanville, and I'd like to stay here until I retire.

"On the other hand, I'm quite prepared to fit into any new arrangement. I am sure we are all a bit skeptical when it comes to making a change, but we must face these things and not hide our heads in the sand."

When the regional municipality of Durham was established last January, Bowmanville ceased to exist. It became part of the new town of Newcastle, although the Bowmanville postal district still remains a do the highway signs.

But Bowmanville PUC — in its presen form — is doomed. The utility, which ha 3,600 customers and a staff of 11, will either join forces with Newcastle PUC ar Orono in a second-tier utility in the new town of Newcastle or will become part o one regional utility replacing 11 existing municipal utilities and Ontario Hydro's rural system.

The effects of regional government have already been felt throughout Durham's 960 square miles. Bowmanvill and other utilities which have been resp sible for water as well as electricity have

Ajax Hydro's future is still up in the air. In the meantime, line crews carry on their day-to-day activities



Ajax Hydro manager Joe Mason (right) ponders the future of his utility. Below, Walter Beath, Durham's regional chairman, stands in the grounds of the region's administration building near Whitby.





een told they will lose their autonomy in
e formation of one large water utility.
echnically, the takeover occurred in Jan-
ary, but the utilities have continued to pay
taff and handle accounts until formal
ansfers are complete. Some utility man-
gers feel this is an omen of what will hap-
en to Hydro in the region.

Just what will happen, and when, is the
ver-riding question. Durham is only one of
2 restructured municipal governments
stablished since 1969, and one of five
hich came into existence this year. Utili-
es in all of them face similar problems.
one wants to lose its identity, but all real-
e some sort of restructuring is inevitable.
has been since the Ottawa-Carleton
egion was established in 1969, followed
y Niagara in 1970.

Durham has a population of more than
20,000 and consists of eight area munici-
alities including the city of Oshawa, the
wns of Ajax, Newcastle, Pickering and
hitby, and the townships of Brock, Scu-
g and Uxbridge. Previously, there were
local councils.

What distinguishes Durham is its prox-
ity to Metropolitan Toronto, the pro-
sed Pickering Airport and the new
anned North Pickering community.
hese factors give Durham regional
thorities more than their share of head-
hes for a government in operation less
an a year.

Regional Chairman Walter Beath says
e's got three years to come up with an
ficial plan and the restructuring of utili-
es may have to wait until such schemes
the new community and the new airport
e well in hand.

Across the province, the consensus
pears to be that the utilities should be
panded along local boundary lines as
cond-tier units rather than having one
lity for an entire region.

To some extent, they have the argument
at second-tier utilities have proven suc-
ssful. They can point to Metropolitan
ronto which, in effect, saw the creation
the province's first regional government
in 1954. Metro Toronto still retains six individual utility systems.

In fact, the Durham utilities, in a joint brief submitted to the provincial government last year, said: "The size of the proposed region (Durham) is geographically far larger than Metropolitan Toronto, and most of the municipalities are much larger than the Toronto boroughs where each electric system is operated by a separate commission. We believe, therefore, that in time with population growth, the municipal commissions will become just as effective as a regional commission, and they would have the advantage of being more closely in touch with their customers and local conditions."

The Ontario Municipal Electric Association, which represents utility commissioners throughout the province, agrees that some restructuring of utilities is essential to get away from small, uneconomic units.

Last year, the Ontario government established a committee comprised of government officials, Ontario Hydro personnel and representatives from the OMEA and the Association of Municipal Electrical Utilities to develop a report on restructuring.

Donald Hamilton, OMEA nominee to the committee, said they did not hesitate to consult with knowledgeable people in the electrical distribution field.

Mr. Hamilton said the committee invited municipalities and electric utilities within existing or designated regional and district governments to submit briefs and reports on restructuring.

"While imposing a restrictive deadline for receipt, the committee got more than 80 responses ranging from mere acknowledgements to in-depth studies of the impacts which could be expected under various principles and the criteria under which new utilities could be established," Mr. Hamilton added.

The committee strongly recommended that the municipal utility structure with its system of commissioners be retained, but it left open the question of whether these utilities should be upper tier (one for the whole region) or lower tier (several utilities within each region). This contrasts with the original recommendation of Task Force Hydro calling for upper-tier regional utilities.

The restructuring committee also recommended that in each new utility the first commission be appointed with the option of electing subsequent commissioners. Again, this contrasted with the proposal from Task Force Hydro that regional commissions be appointed by council.

The restructuring committee's report added: "Area utilities would, in all probability, provide the customer with better accessibility to the authority. From the customer's point of view, area operation would appear less disruptive in that it occasions minimum departure from the status quo." However, the committee said area operations would be confined to a relatively narrow financial base, incur greater re-establishment costs and inhibit the application of uniform customer rates across the region.

In Durham region, several utility managers agree that under a regional utility rates would be uniform. But they feel customers would pay more than under the existing setup.

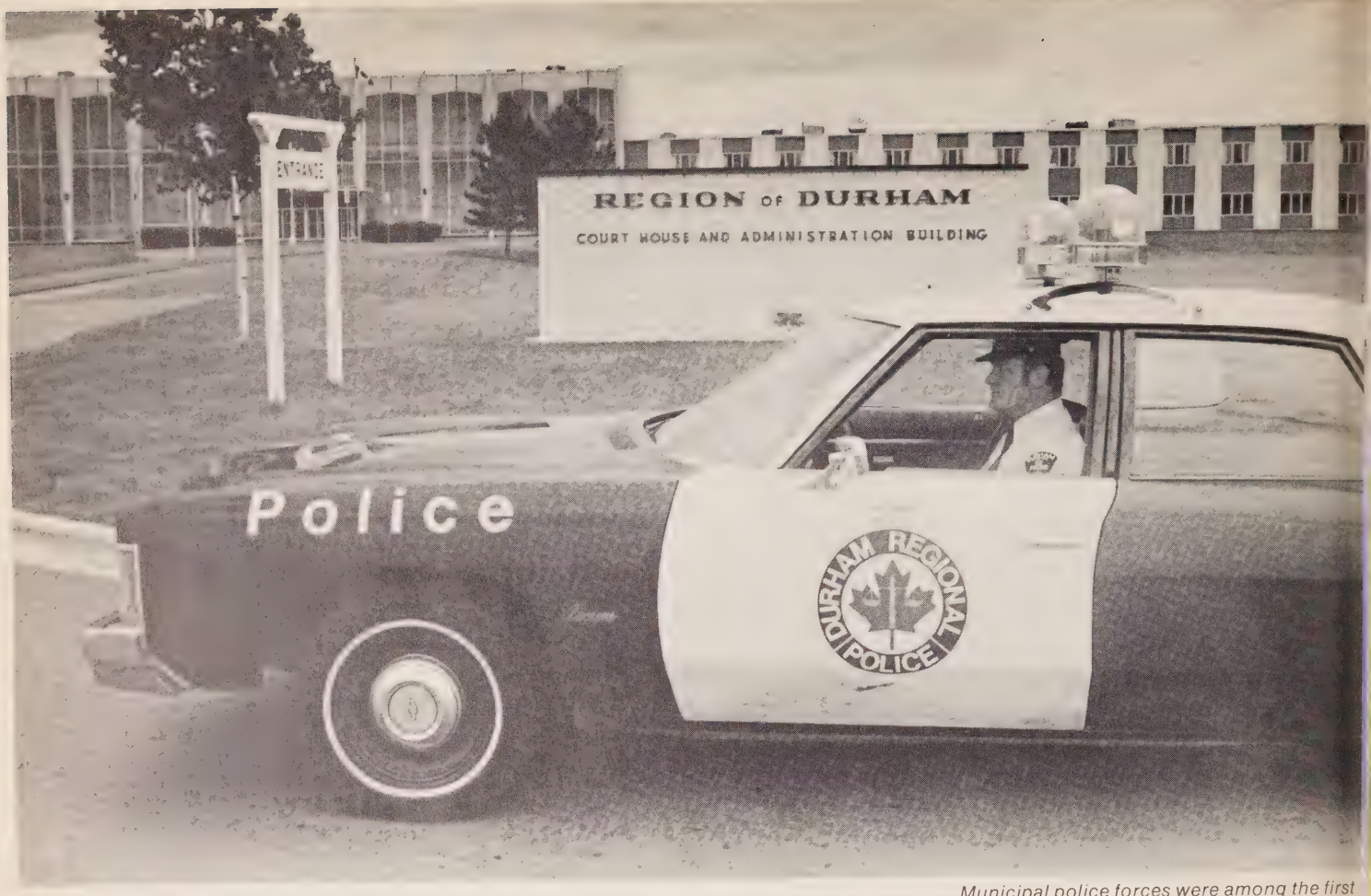
"If an upper-tier utility is established, Oshawa residents will be paying approximately 7.5 per cent more than they are at present for electricity," says J.B. Annand, manager of the Oshawa PUC.

Joe Mason, manager of Ajax PUC, says it would cost $720,000 to take over Hydro's assets in the adjacent rural operating area. Through such a takeover, rural rates would go down and Ajax rates would go up to compensate.

"There's just no way they can justify doubling the size of a utility to give the smaller systems a reduced rate."

Mr. Mason says establishment of a lower-tier utility would not present many problems for his operation. Ajax HEC now serves 4,000 customers with a staff of 14. Restructuring into a second-tier utility would probably require one additional serviceman.

Mr. Mason criticized the restructuring committee's proposals on job security.



Municipal police forces were among the first services to be amalgamated in Durham.

"After you've put 25 years into the business, one year's security means nothing," he said.

Mr. Mason also suggested that the restructuring of utilities in Durham region may not be as imminent as many people feel. "Whatever is done they're going to have to take more time over it than they did with regional government. I think it will take three, five or even eight years if we're going to become one big utility."

H.C. Simpson, manager of Whitby PUC, is keeping his fingers crossed that a lower-tier utility is decided on for his area. "If it is, our boundaries won't change. They were just expanded a year or so ago. We have 9,000 customers and cover 68 square miles."

Mr. Simpson is sorry to have lost the water department. "When you lose something that you've built up over the years it hits you kind of hard. Don't get me wrong, though, I'm not afraid of a job in regional Hydro. There will be lots of work to do."

One of the most contentious areas in the province is Niagara region, where arguments for retaining the existing municipal utilities have been going on since 1969. Twelve utilities would be affected, and they feel they should be left at the lower tier.

Restructuring officials argue, though, that this would cost more than the establishment of a single utility for the entire region. A similar set of circumstances applies in Waterloo region where, according to Grant Bainbridge, Ontario Hydro's director of consumer service, it would cost $2 million to set up distribution systems for second-tier utilities as opposed to a few hundred thousand dollars for a top-tier utility.

Sam Jennings, a commissioner at Niagara-on-the-Lake, says the local communities want to own and control their own Hydro system and the assets they've built up over the years.

Mr. Jennings says municipal councils in the region have requested the retention of local commissions. He calls the delays in making a decision frustrating and blames provincial civil servants who, he says, are not knowledgeable in Hydro affairs.

"Our long-range planning is seriously restricted. Niagara-on-the-Lake and other commissions are suffering and the managers of the utilities feel a real sense of frustration," says Mr. Jennings. "After more than five years of study we still don't have a decision. It seems that when the government finds it expedient to further delay action, another expensive committee is appointed."

Mr. Jennings does not class Hydro as tax-supported service like the police, sewer and water facilities, but says it should be operated independently. He fears that if utilities came under regional control the end result would be higher rates and a reduction in the quality of se ice.

One of the members of the restructur committee was Ivan Bradley, who apart from being president of the AMEU is in t middle of the controversy as manager o Waterloo Hydro, one of the 13 utilities ir Waterloo region.

"I certainly don't want an organizatio I've built up over 20 years to be eroded away," Mr. Bradley says.

Utility managers in Waterloo favor th establishment of seven area utilities instead of one regional utility. However Jack Young, the regional chairman, has gone on record as advocating just one ity.

"People have accepted the boundar changes for the new municipalities with the region and many of them cannot understand why they are paying a diffe

OMEA suggests some changes

Responsive to change, the Ontario Municipal Electric Association accepts the government committee report on the restructuring of public utilities, but with a number of important reservations.

In a submission to Energy Minister Darcy McKeough, the OMEA says it particularly subscribes to the committee's view that "the new utilities should satisfy the oft-quoted principle that organizations be structured to provide the widest possible authority at the lowest possible decision-making level." The OMEA suggests a number of amendments which, it says, should help achieve this objective.

In canvassing the local utilities, the OMEA says it found almost unanimous support for suggested changes to two of the government committee's recommendations. These referred to the means by which it is decided whether or not commissioners are elected or appointed, and to the establishment of area municipal electrical utilities.

While the government committee recommends that the municipal council pass a by-law specifying whether the commissioners of a new utility be elected or appointed after the first commission has completed its initial term, the OMEA calls for a public referendum on the election or appointment issue.

The OMEA disagrees with the government committee suggestion that within a region capable of establishing a self-sufficient regional utility, the formation of area utilities should not be pursued if it is clearly apparent even one of the area utilities is not a viable undertaking.

The OMEA says the option of establishing area utilities should remain open if the majority of area utilities is viable and the remainder can initially be served by the power district.

Similarly, many of the other changes suggested by the OMEA relate to a rewording of the recommendations to strengthen the concept of lower-tier utilities.

On the subject of employment, the OMEA calls for anyone accepting a job with a new utility to continue on a salary not less than that paid by the previous utility. The government committee puts a time limit on keeping at least the same salary. □

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ower rate from their neighbor, even ough they're in the same municipality nd have the same taxes," Mr. Young said.

"On the basis of general principle, if it is alid to have one wholesale water rate, olice rate and garbage rate then it seems ogical not to have one for Hydro. If we e truly going to be a regional government roviding the best possible service in all reas for our people, then an upper tier tility is needed."

However, Mr. Bradley said the recommendation to allow council committees to articipate in the appointment of the first ommissioners in the restructured utilities ightens him. "Once the first commission as been appointed, there may not be the eal to fight for elected commissions from ien on."

The restructuring committee devoted onsiderable effort to the staffing problems iat could come about through restructurg of the municipal utilities. It suggested iat in some cases tradesmen will be equired to develop additional skills in rder to provide safe and efficient plant aintenance and operation.

However, it felt that the disruption of aff could be less of a problem than many ow fear.

"The passage from one set of circumances to another can be made with the inimum of disruption and ostensible roblem areas can be opportunities for the ew utility to enhance service to the public nd job satisfaction even though some taff may expect the process to be one of ersonal disruption and dissatisfaction," ie report said.

In the event of employees being transrred from one utility to the other, the ommittee proposed legislation to ensure a uaranteed period of employment and the otection of major benefits.

"The committee did not see that overaffing would present a problem in any of ie regions studied," the report stated. Economies of scale may be achieved in ome instances permitting slight staff ductions over the long-term which will be chieved through normal attrition.

"It follows that staff now presently assoated with the distribution facilities would be required in the new organization, although not necessarily in an identical capacity."

The restructuring committee also called for the establishment of a central coordinating committee to be responsible for local rationalization studies. In addition, it suggested the functions of study teams in regional government areas is to collect, compile and analyze local data and statistics, forecast population and electric load growth, examine the requirements for re-establishing and separating distribution facilities and provide cost estimates associated with the various alternatives, analyze customer rate levels, identify problems areas, ensure local interest groups have an opportunity to express their opinions and generally study their particular utility situation thoroughly.

The committee felt that the Minister of Energy should appoint the chairman of each study team, but that membership be made up of a broad cross-section including municipal councils, the OMEA, AMEU and Ontario Hydro.

Mr. Bradley feels the makeup and terms of reference of these committees is of major importance. "Once the utilities have been restructured, they'll have to last a long time so we'll have to do things right, initially. Once something is established, it's pretty hard to change." □

Lattice·look out, slim·line in

Ideas change. Fashions change. And today's transmission towers are expected to harmonize more with the landscape than their older-style lattice-type counterparts.

photos: Gary Smith

High-voltage transmission lines are taking on a new look and the building of them is taking on a new dimension.

Take, for example, a two-mile stretch of 230-kV line from the Cooksville transformer station under construction at the Queen Elizabeth Way and Mississauga Road.

Conventional lattice-type towers have given way to new improved-appearance single pole structures of the type recommended by the Solandt Commission for Ontario Hydro's proposed 500-kV network to link new generating stations with the provincial power network.

The two-tone green poles weigh about 13 tons each — about twice the weight of an equivalent lattice-type tower — and range in height from about 122 to 142 feet. The two shades of green were selected to help make the structures blend in with the natural surroundings.

One of the main differences in setting the new towers, says Ray Freeman, Hydro's Toronto construction zone superintendent, is in installing the foundation. This involves boring an eight-foot-diameter hole 20 to 35 feet deep to set the stub. The stub is encased in concrete poured into a reinforcing steel cage.

Poles are delivered to the site in sections which are then hydraulically jacked or telescoped together. Arms are bolted on. Insulators and travellers are connected. The assembled tower is then hoisted on to the stub by an 80-ton crane.

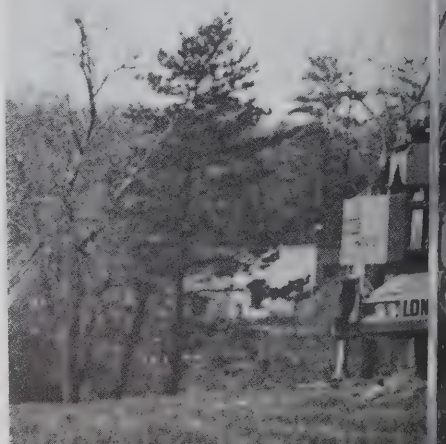
Mr. Freeman says that once the ground work has been completed, it takes only 30 minutes to an hour to erect the pole, depending on the right-of-way condition.

Assembly of conventional lattice towers takes considerably longer because each member has to be bolted together individually. However, foundation work for the lattice tower is nowhere near as extensive as that required for the new design.

Mr. Freeman says the eight-foot-diameter holes required to support the poles have meant the engaging of some of the largest earth-boring machines commercially available. Foundation bores for lattice towers are normally between three and four feet in diameter.

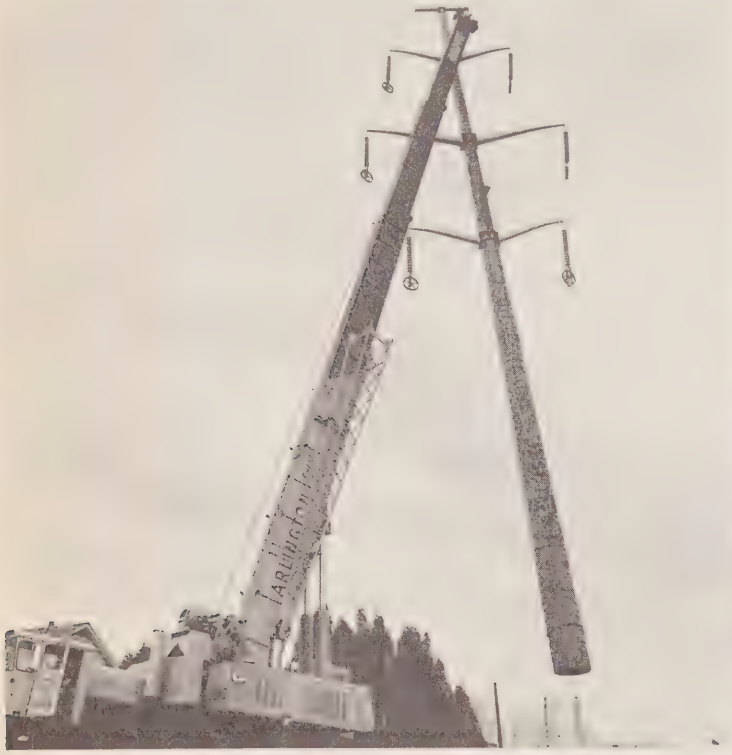
Although there's a saving in man-hours in assembling the improved-appearance poles over the lattice structures, this is more than offset by increased costs for the greater amount of steel needed for the poles — when the manufacturers can get it.



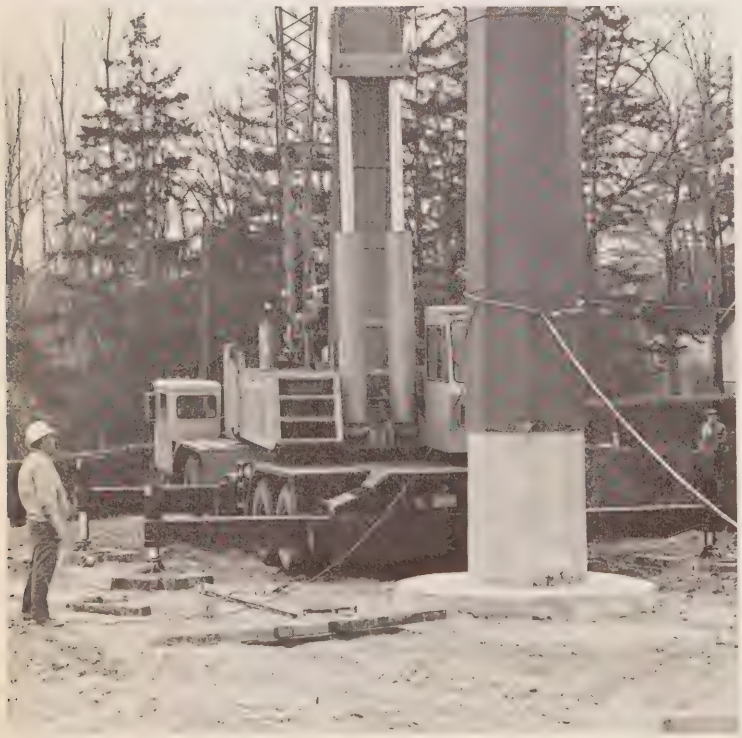



GROVE

New towers are delivered to the site in sections. After assembly on the ground, the 13-ton structure is hoisted on to a steel stub embedded in concrete. An 80-ton crane is used to place the huge tower on the stub. Depending on right-of-way conditions, it takes between 30 minutes and one hour to erect the pole.









Ontario Hydro's conservation role

Address by George Gathercole, Hydro chairman, to the Institute of Power Engineers energy conservation conference in Toronto.

Many of you will be aware that Hydro's policy towards the marketing and use of electricity has been undergoing change. The most visible part of this transition may appear to be the shift in emphasis in our advertising in the press, radio, and TV about the conservation of electricity. But it goes deeper than that.

We believe that conservation must consist of more than slogans and exhortations. Hydro can tell its customers to conserve electricity, but in my view its major role is to show them how this can be done to their advantage.

For that reason, the largest part of Hydro's program—and in the long run probably the most effective—will consist of research in applications and technology; improved standards of insulation and efficiency of appliances; working with commerce and industry to avoid waste; analysis of rate structures and off-peak energy use; co-operation with national, regional, government, consumer and industry groups to establish and promote improved standards of energy use; seminars and training programs for industry; customer information; and training programs for Ontario Hydro staff who will be responsible for carrying out the program.

At this time, I can't be more specific than that. The board of directors has endorsed the conservation ethic and details are now being worked out by Hydro's marketing people, who I suppose in future will be better described as energy consultants than as salesmen.

The implementation of such an extensive program for all our customers—residential, commercial, industrial, and agricultural—raises formidable difficulties. It means striking a delicate balance between conservation in the sense of saving resources and serving the optimum electrical needs of the people.

Let me not leave the impression that Hydro has been doing little in the area of conservation until now.

The new look to which I have referred is really an enlarged and developing version of activities which have been going on for many months.

In the residential area, one of the greatest potentials for energy conservation is with improved standards of insulation. In recent months Hydro and the Canadian Gas Association and the petroleum associations in Ontario, Quebec, and B.C. submitted a joint energy industry brief to the associate committee of the national building code. The brief requests improved thermal insulation levels in residential construction—regardless of the kind of energy used—to the requirements of the current CSA standard for electrically heated dwellings. If accepted, this could represent a reduction in energy consumption in heating of more than 30 per cent for a house insulated to these standards.

Some time ago we started customer information programs dealing with insulation, basic wiring, and so forth.

Hydro is also involved in joint programs with the Canadian Standards Association and the Canadian Electrical Association to improve the efficiency of major appliances.

Hydro's research staff, for example, are developing standards for refrigerator-freezers in co-operation with CSA which will allow the buying public to identify and choose a unit on the basis of its consumption of electric energy.

Potential savings in commerce and industry are even greater, since this sector makes up some 60 per cent of Ontario's total electrical consumption. Hydro has been actively involved in providing information and assistance to consultants and owners on the economic and efficient use of energy in commercial projects. Today's rising energy prices mean that in some cases the cost of energy over the life of the building can represent 40 per cent of the total capital investment.

Now the choice of energy must be of primary concern, compared with the past when the initial capital cost was a major consideration and no one worried about the cost of energy to operate the building.

Hydro's new head office building, about which you may have heard, incorporates a variety of new techniques which may serve as a model to the construction industry. Some of the major features which produce



Chairman George Gathercole

energy savings are a double-glazed reflective glass curtain wall, designed to reflect heat outwards in the summer and inwards in the winter; a heat pump to use the heat from lights and people; and a million-and-a-half gallon water tank to store excess heat to be reclaimed as required when temperatures drop.

In industry, the trend to electricity is already rapid in some sectors. The necessity of abating pollution has been a factor.

During the last 10 years, the metals industry increased its use of electrical energy by 300 per cent. With the threatened shortages of fossil fuels and the prospects of higher environmental standards, the transition to electric power is expected to intensify.

Where these demands emerge, Hydro works with the industrial customer to ensure that electricity will be used as economically and efficiently as possible.

A recent example of this type of co-operation is the series of energy management seminars for industry sponsored in many provincial centres by the Ministry of Industry and Tourism and Ontario Hydro. Nor should we overlook agriculture, where modern production methods require greater and greater use of electricity.

There is nothing in this program which directs or orders people to cut back their consumption of electricity. We have no mandate to tell our customers that they must limit themselves to so many kilowatt-hours a year, any more than we have a right to tell them to buy bicycles instead of cars. The real responsibility for imposing conservation until it hurts lies with the elected representatives and ultimately the people.

Thus, Hydro's is a moderately and finely tuned approach that endeavors to conserve by avoiding unwise and inefficient use. It does not, at least at this stage, discourage the use of electricity, although should circumstances warrant it that could come. The best assessment that Hydro can make of the future is that the diminishing supply of fossil fuels is leading to an imminent and substantial switch to electric power, which is the logical alternative. In Ontario, the specific alternative is nuclear power from uranium fuel.

We believe that the application of electricity, particularly based on nuclear energy in the longer term, constitutes a method of freeing crude oil and natural gas for the powering of vehicles and multiple other applications.

It has been projected that electricity which now provides less than one-quarter of all energy uses, will continue to increas until by the year 2000 it could be supplyin at least one-half of all energy requirements. If electricity is to meet this challenge, providing a partial alternative t the rising demand for oil and natural gas- in a sense husbanding them for their high priority uses—the expansion of electric power systems must proceed at a very hig rate. While no one can view with equanim ity the immense commitment of resources in bringing these facilities to fruition, the task must be undertaken if the people's needs are to be met.

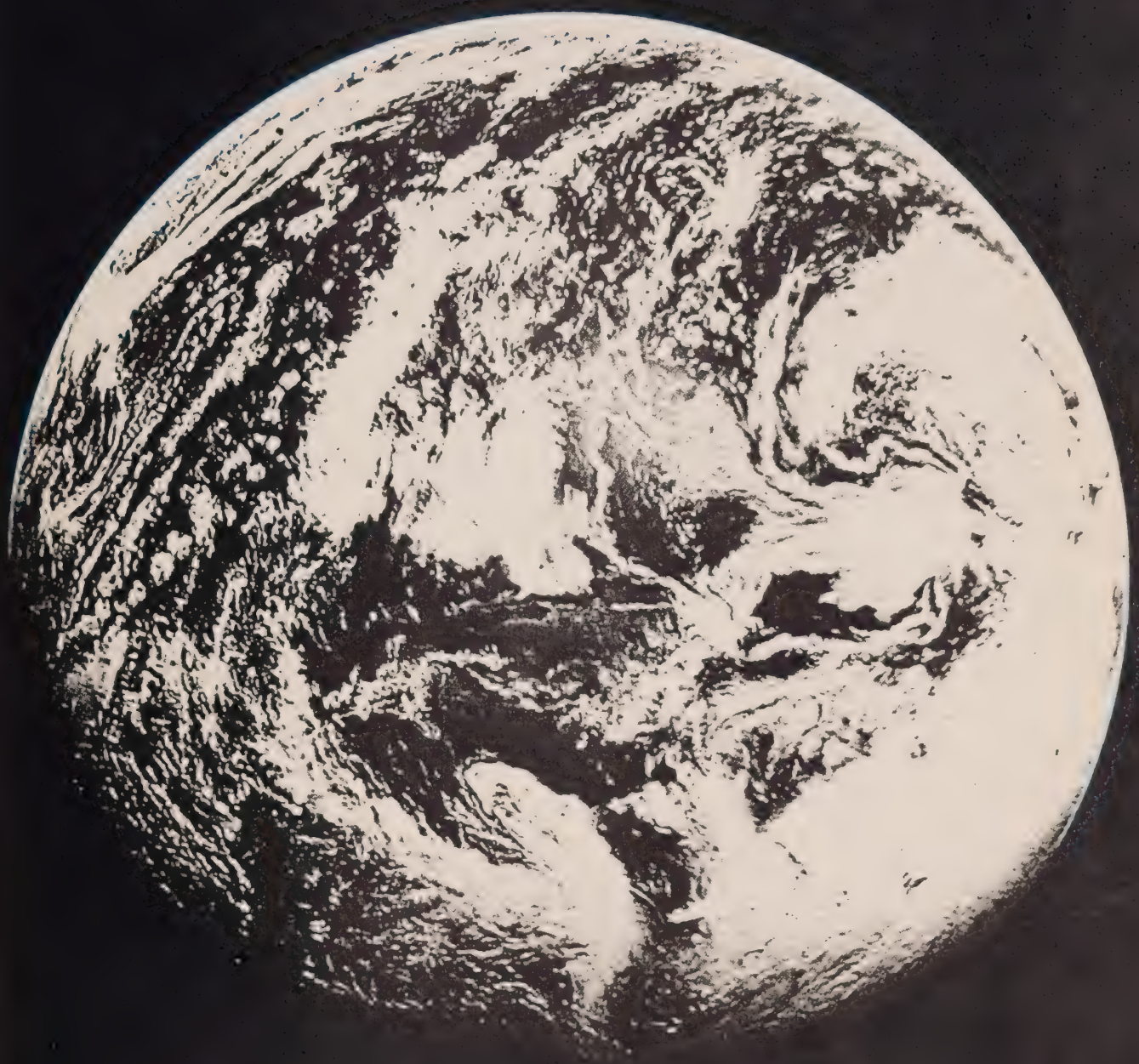
I am well aware that in our modern soc ety we use electricity and other energy supplies lavishly. Economies in the consumption can be realized with relatively little sacrifice.

Last year, our electric energy growth totalled 7 per cent and we are projecting continuance of this increase over the ne 10 to 20 years.

On the other hand, a number of U.S. electric utilities operating substantially o fuel oil experienced a reduction in the demand, particularly after the imposition the Arab oil embargo last fall. Consolidat Edison in New York, for instance, reporte a drop in demand of 7.8 per cent. Some other utilities also experienced a decline but a major part of it was no doubt a resu of the relatively mild weather and higher price.

The demand for electricity is not perfectly inelastic and as rates rise some reduction in consumption will occur. It would therefore be reasonable to expec some moderation in the rate of growth ir electricity demand even though the pric of other fuels ascends. If the role of elec tricity is as described, it would be inadvi

Conservation is essential
for the preservation
of the earth.



able to cut the construction program to accommodate a temporary dip in the upward trend.

Remember that new generating capacity has already been committed for the next half dozen years; to spin out this construction schedule would be very costly. From a practical standpoint, any curtailment would be restricted to plants that have yet to be committed—that are scheduled for the mid-1980's.

It makes a great deal of difference to a utility whether the conservation effort seeks to bring about a reduction in consumption of electricity in the short run or the long run. In the short run, the effects can be very disenchanting to both the utility and its customers.

Hydro's financial staff have made some calculations which show that if it were possible to achieve zero growth in electrical demands next year, Hydro would incur a "net" revenue loss of $41 million. A reduction of just one percentage point would represent a net loss of $5 million, and this money would have to be made up by our customers in the form of higher bills.

I emphasize the words "net loss". If demand growth dropped to zero next year, Hydro's revenues would decline from $1,205 million to $1,126 million, a total of $79 million. Costs, however, would fall by only $38 million, making a difference of $41 million.

The reason for this deficit, of course, is the heavy fixed charges Hydro is committed to regardless of how much electricity it generates.

In the United States this is not hypothetical, but very real. Dozens of U.S. utilities have requested rate increases, partially on the basis of lower consumption by their customers.

This makes customers angry.

They voluntarily cut consumption to help the country through an energy crisis, and then have to pay more for patriotism on their electric bill.

So strong has public reaction become that some regulatory boards have apparently requested utilities to find some other reason for requesting higher rates.

The public won't swallow falling consumption as the reason.

As the French say, a man should swallow a toad every morning to make sur that he won't swallow anything worse during the rest of the day.

The answer to the paradox that conservation in the short term raises rates is that all utilities build their facilities in accordance with their forecasts of demand. If consumption falls, revenue declines more rapidly than costs which have to be sprea over fewer units of electricity, raising the unit price to the customer. The results of conservation, particularly if significant sacrifices are entailed, may therefore be highly disappointing.

In time, adjustments in the capital program can be made. But as I have pointed out, you can't build power station and transmission lines overnight. If load demand outpaces supply—if you have made the wrong guess—the electricity yo may need won't be available. It now takes 10 years to select a site and build a powe plant.

A scattergun, non-selective approach t conservation is not good enough. It can produce some strange results which are detrimental both to the utility and its customers. Some American utilities are finding that reductions are taking place only in off-peak power consumption, thus lowering load factors. The real pay-off of conservation lies in reducing growth in peak demands, thus allowing substantial savings in capital investment in new facil ties as well as in fuel.

Viewed in this light, the role of utilities such as Ontario Hydro in energy conservation, as far as public opinion is concerned, can be summed up in one word: "difficult". Or two words, "damne difficult".

As I have said, Hydro has been activel promoting conservation for some time, a you probably have noticed that theme emphasized in our newspaper and TV advertising. You may have also noticed that Hydro has applied to the Ontario

nergy Board for approval of a $16 million pansion program, and increased whole-le power rates by 15 per cent.

On the one hand we are saying: conserve electricity by using it wisely." n the other, "let's spend $16 billion to ake more, and raise the rates while we're oing it". For someone who doesn't nderstand the problem, it must seem like doctor who prescribes a diet for an verweight patient, and then suggests that buy an expensive new food freezer ecause he'll be needing it in a few years.

Explaining this apparent paradox is an sential job, not only for Hydro but for the ntire electrical industry, if we are to keep ublic support.

You asked me to talk about the role of ntario Hydro in energy conservation and have, but there are broader implications.

We realize that even in the limited area of ectricity the success of effective conser-tion measures requires the co-ordinated pport of government, its agencies, ommerce, industry, and the public.

The former American energy administra-r William Simon (now Secretary of the easury) said some months ago that the g problem is "not letting the American ople go back to sleep again. They nnot continue to live their wastrel ways." e point here, naturally, is that you can't nserve energy in isolation, because it is art of almost everything in our daily life. akes a lot of energy to make a car; to oduce appliances; to turn out the dispo-ble products and elaborate packaging of r throwaway society.

And I might note here that personal gality, such as turning off lights and vering thermostats, valuable though it y be, really is not going to have much ect. I read the other day that a man carding his electric razor and returning lather and blade would use up more ergy for hot water in three days than his ctric razor would consume in a year.

Most of the main reasons for the gener-s use of energy by North Americans is ated to the basic structure of our society d social change cannot be wrought by dro or electric utilities alone.

The transition to a wise use and conservation ethic will take time. Moreover, it will require public support and government action and leadership. As the Bible says in Corinthians I: For if the trumpet give an uncertain sound, who shall prepare himself to the battle?

In summary, then, the points I would like to leave with you are:

1. Ontario Hydro has an important role to play in the conservation of electric energy, and it has assumed that role.

2. With the diminishing availability of fossil fuels, demands for electricity will continue to climb and utilities such as Hydro must maintain a high rate of expansion if they are to serve their customers.

3. Simplistic answers to conservation, such as cutting back on electric power expansion, could be disastrous.

4. The electrical industry must explain this seeming paradox of conservation on the one hand and expansion on the other if it is to retain public support.

5. Any conservation effort must have government leadership and public support.

6. Society, in the long run, must work toward some fundamental changes in the style of life.

It's a complex world. Although there are no simple one-line answers, remedies are at hand if we are careful in our choice of policies and practices to attain them.

I am not one of those forecasting the end of the world in the next day or so. Far from it. I am confident we have the resources and resilience to solve our problems. I hope we also have the wit to do so intelligently. □

AMEU conference for management

Government presence a reality — Bradley

President calls on delegates to settle disputes and resolve major problems.

Utility people must recognize the presence of the Ontario government in the electric energy field, says Ivan Bradley, president of the Association of Municipal Electrical Utilities.

Mr. Bradley told delegates to the association's summer conference for management at Queen's University that the government felt its entrance into the electric energy field was a matter of necessity.

"Because of the scale of expansion involved in the next two decades, it will require government participation to finance the multi-billion-dollar programs which will be required. Finances will not only be required, but so will political influence to secure sufficient uranium supplies for future electric energy sources," Mr. Bradley said.

"Government involvement in the electrical supply and distribution business has been viewed by some as an intrusion," he added.

"Some feel this has rocked the very foundation of the power co-operative that has survived nearly seven decades. Although the idea of the electric power co-operative was born in the municipalities, it can be rightfully said that its formation and implementation required government action.

"And now — nearly seven decades later — we find ourselves under the government's microscope. If our methods of operation do not suit the public through such things as lack of uniformity, you may be assured that the lens on the government's microscope will be adjusted to get us into better focus for remedial action," Mr. Bradley warned.

He called on delegates to close ranks, forget petty differences and sit down to resolve major problems.

Mr. Bradley said that the luxury of local self-determination might well become a luxury utilities can no longer afford.

"We are now locked into a situation which is entirely in conflict with the free-wheeling ideas of those who are following. For instance, today's college students have what is known as freedom of choice. They can flit from one campus to another. They have the choice of taking serious courses, or they can take Mickey Mouse courses on the management of a fantasy world.

"But AMEU people don't have these choices. We are municipal employees. We are expected to perform at a high level of service to the public. We can't walk out because we think T-shirts are preferable to business suits.

"We are accountable and we have obligations which must be met. Each one of us chose this career — this career of meeting phenomenal growth in the face of shortages, high costs, social unrest and you name it.

"But we're not just selling hot dogs. We must plan, we must co-ordinate our actions, we must be patient with the public and the government. And, above all, we must keep the lights on in our cities and towns," Mr. Bradley said.

New policy for injured workers

The main purpose of sweeping changes made at the Workmen's Compensation Board of Ontario was to ensure a full measure of justice for workers injured at their jobs and to guarantee full value for every dollar spent.

Board chairman Michael Starr told the annual meeting of the Electrical Utilities Safety Association, held every year in conjunction with the AMEU summer conference, that it was considered essential that a more human relationship be established between the workman, the employer, and the WCB.

"Government agencies and Crown corporations are often seen by the general public as bureaucratic octopuses, with a confusing variety of arms and a compelling desire to stay submerged in a sea of red tape," Mr. Starr said.

But, he added, this is not necessarily true and the WCB wants the people it deals with to know that it is a highly-accessible organization. "We're prepared to meet their needs with a minimum of formality and a maximum of understanding."

Mr. Starr said the WCB has taken a big step forward in easing the transition from serious incapacity to a full-time job with a new general policy of extended benefits to injured workmen.

He said the new policy affects an injur worker who is physically ready to return t modified work, but is not able to perform his regular job and cannot find employment. The WCB now pays up to six week of additional compensation in such case and provides full vocational rehabilitatio assistance.

"This practice," he said, "was used o a limited and selective basis before, but now it applies generally."

Another recommendation of the task force which looked into the operation of the board, which is currently under revie concerns the plight of many who now receive WCB pensions.

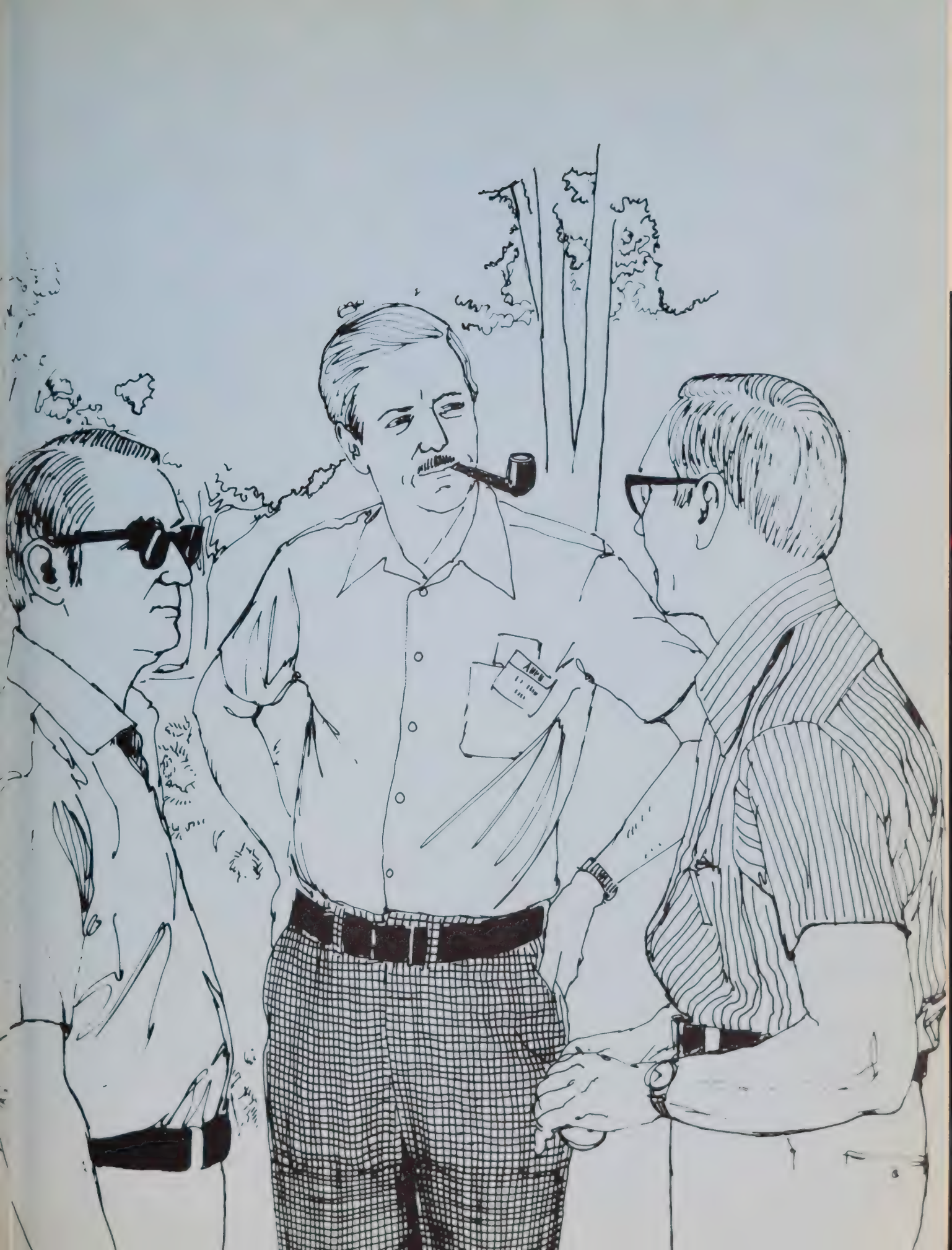
"Inflation over the years — and partic larly during the past few years — has stripped many pensioners of the securit they once were assured. Fixed incomes provide less and less and the cost of livi soars, therefore many disabled workme receive pensions that are geared to another time.

"The benefit levels on which these p sions are based remain the same as the were at the time of the accident and the former levels do not reflect the wages o today's marketplace. Thus, they do not truly compensate for lost earnings in te of today's dollar.

"Justice demands that pensions be adjusted to provide realistic compensat for lost earning power and the board ha submitted information to the governme for consideration," Mr. Starr said.

As he discussed other changes with the WCB, Mr. Starr suggested that no p ticular change is earthshaking in itself, combined they represent a radical new approach to helping solve the multitud problems faced by severely injured wo men.

"We have made, and will make, othe changes to ensure that workmen and



employers receive the best service from the WCB that it is possible to give," Mr. Starr said.

But, he pointed out, accident prevention is an integral part of the compensation system and it's been demonstrated over and over again that most accidents can be prevented by management.

"No one who is exposed to the suffering, the loss of earning power and the personal tragedy caused by occupational injuries can avoid a feeling of real concern that so many needless accidents are allowed to happen.

"Top management must be convinced that accident prevention is not only their full responsiblity, but that the safety of their employees can be achieved by the application of a sound, knowledgeable, commonsense approach to the problem." Mr. Starr said.

Budget attitudes must change

Making a strong case for budgeting and control within the municipal utility industry, D.E. Shipston, comptroller at London PUC, said that the time has come when rudimentary methods of estimating one's fiscal requirements — generously giving or taking a few percentage points — is no longer practical or acceptable.

"We all recognize that we are going to experience rapid cost escalations in most aspects of utility operation, and because there is a limit to what is practically and politically acceptable, in the way of yearly rate increases to the consumer, the ability to forecast and control spending within close limits becomes almost mandatory," Mr. Shipston said.

He added: "It has been said entities that provide community service as we do tend to be operated rather than managed. Service to the consumer has been the overriding objective. Cost considerations have become only those of ensuring the funds will be on hand at all times to meet the demands for service.

"I suggest a rethinking of many of our present attitudes with respect to service to some of our consumers may be forced upon us by the pressures of the current inflation spiral and the long-term spin-off effects of new oil-cost arrangements both at home and abroad."

Budgeting, Mr. Shipston said, is a management tool used for shorter term planning and control. In short, budgeting is a method of control that usually emphasizes monthly and one and two-year plans.

"Planning is the act of looking into the future, and it only happens when someone takes his mind away from day-to-day problems to think and talk about the future.

"Historically, budgeting has been treated as a device to limit expenditures. The more modern approach is to view the budgeting process as a tool for obtaining the most productive use of resources. It's a search to improve operations, a continuous effort to get the job done maximizing all of the utility's assets.

"Properly implemented, a budget requires a set of realistic performance standards or targets, continuously monitored, reviewed and evaluated.

"In my view, the budgeting process for utilities must embrace the variable, or flexible, concept. Nothing is static about our industry and our priorities continually change.

"A budget must be adaptable to those changing priorities," Mr. Shipston said.

Bid to speed new housing

Ontario's Housing Action Program is a deliberate attempt on the part of the provincial government to interfere with the ordinary workings of the housing production and residential land supply markets, says Wojciech Wronski, assistant deputy minister, community planning, of the newly-created Ontario Ministry of Housing.

Mr. Wronski said the objective is to accelerate the production of new houses over the next few years and to make them available to low and middle income hous holds at reasonable prices.

"As a special emergency program which has been given high government p ority OHAP has, perhaps inevitably, attracted some controversy," he said.

But he added that the Housing Ministe is fully aware of the problems and has be careful to explain that OHAP requires the removal of roadblocks to new developme at the municipal level and the co-ordinat and expediting of various provincial pro- grams affecting housing targets.

"In order to speed production of hous ing," Mr. Wronski said, "it is probable th will be some short-term delays or adjust- ments in the goals of some other provinc programs. The environment of some hou ing action areas may not be able to achieve immediately the standards of excellence — the expensive standards - which most of us have been taught to expect and insist upon in the developme of new communities."

Production targets of OHAP are not o expressed in the number and type of un but also in terms of income mix and fina price.

"Therefore, the private developer pla an important role in the program and is being asked to bind himself to making a percentage of all units in selected subd sions available for the needs of modera income families.

"The private developer and the mun palities themselves are also being urge assist the government in finding other methods and techniques for achieving program's production targets by identif suitable housing action areas and by fo mulating program-effective local housi policies."

Questions of widely-varied residenti servicing standards, the pros and cons underground versus overhead systems the difficulties utilities face daily with th number of levels of jurisdictions involv the provision of services to the citizens Ontario will all have to be ironed out, M Wronski added.



Informality was the key at this year's AMEU summer conference and delegates took advantage, between lectures, of the peaceful surroundings at Queen's University. At left, Bill Hollister, Tillsonburg PUC commissioner, Jack McDreight, Woodstock PUC secretary-treasurer, and John Middel, Tillsonburg PUC manager talk over the program. Below, a group of delegates soak up some sunshine.



New ministries cut across old lines

The creation of provincial secretaries — the so-called "super-ministers" — in the Ontario government re-organization was an attempt to split up some of the responsibilities that had rested on the shoulders of all cabinet ministers, said Revenue Minister Arthur Meen.

However, he hastened to add, both types of ministers have equal voice in the cabinet. "That's one reason why most of us wince whenever we hear that misnomer super-minister."

Mr. Meen said the first premise on which the government was reorganized was that people today expect, and receive, a far wider range of services from government than were delivered — or even contemplated — a few years ago.

"The second premise," he said, "was that as society grows more complex and as public concerns and values change, any important action by government, any government, is felt much more readily by large segments of the population than it once was.

"This presence of the government in the community has many implications. In terms of government, it means two fundamental things:

• That the manner in which a government operates — and therefore the manner in which it is organized — is crucial to the entire population. Only an effectively organized government can be capable of responding effectively to the extensive needs and increasing demands of the people it is intended to serve.

• That the government's activities can no longer be labelled simply and clearly as they once were, with department names like highways, industry and municipal affairs."

Mr. Meen added that virtually every important government program or project cuts across the old lines of authority. The development of a major highway, for instance, has important implications not just for motorists and transportation companies, but for towns and town planning, for environmentalists, for industries and their employees who may become commuters, for marketing specialists and their companies' production needs and for the entire tourist industry.

"This fact of life was just as evident outside the government as inside it. At the same time, the old system was becoming increasingly obsolete for reasons that were much more apparent to people within the government.

"The Committee on Government Productivity, which studied the government's organizational needs and recommended the organization we now have, identified four basic problems it felt should be remedied.

"The first of these centred on the role of a minister and the extraordinary demands which that role makes on the individual. At the very time when each minister's responsibilities were becoming more complex and difficult in such matters as policy-making and priority-setting, other duties were also getting more onerous.

"A second problem was that the demand for services was outstripping revenue. Growth in expenditures would have to be contained, and one way to do this was to introduce better controls by means of a more efficient organization capable of responding more quickly and more effectively to changing situations.

"Another problem spelled out by the COGP which is as much a matter of concern to those of us in the government as it is to the average taxpayer was the size of the government itself, Mr. Meen said.

The COGP pointed out "there comes a point when an organization grows so large or is involved in so many complex and inter-related operations that it becomes increasingly difficult to manage, or its management takes up so much time and effort that little or no time is left for policy formulation."

The committee also pointed out that a process of alienation occurs between the citizen and his government as the government grows in complexity and size.

Among the COGP recommendations to overcome the organizational complexities were the establishment of a new process for setting priorities and the creation of 1[illegible] ministries in place of 22.

Mr. Meen said the new ministries were not created from old government departments, but were created from programs and parts of programs, or from branches departments, according to combinations that seemed the most effectively functional.

However, Mr. Meen said that he "would be less than frank" if he did not point out certain unforeseen drawbacks to the new structure.

"The policy fields themselves provide great amount of the consistency and coordination among related ministries, but the provincial secretaries' positions do n provide the public recognition that politicians typically desire. Most of us who are frank about our ambitions would conced there is a certain amount of ego involvm here: we not only want to feel we are doi a worthwhile job, but we also want to receive recognition for the things we do. We're only human.

"To some extent, we're also motivate by the need to survive. A person's chanc of winning re-election are far greater if h is known for certain identifiable accomplishments, and it's almost impossible fo him to gain that sort of reputation by wo ing at the nebulous and often unglamorc task of priority-setting and policy-makin Mr. Meen said. □

along hydro nes



Engineer shortage next?

anada could be hit by a serious shortage f engineers by 1976 when only about ,500 engineering students will graduate cross the nation, says Dr. P.D. McTag- art-Cowan, executive director of the Sci- nce Council of Canada.

In a convocation address at Lakehead niversity, where an honorary Doctor of cience degree was conferred upon him, r. McTaggart-Cowan said that four years go somebody found a few engineers who ere temporarily unemployed — perhaps ven one or two engineering PhD's who ere looking for a job.

"We looked across the border and saw ie temporary dislocation of a number of ngineers as the U.S. space program was ound down, and we panicked and imme- ately predicted vast surpluses of engi- eers to the extent that you would be aving the streets of Thunder Bay with eir dead bodies.

"I protested against the counsel of oom at that time, but unfortunately only the pages of Science Forum, with a max- num readership of 1,800.

"What I feared then is now staring us in e face. Students listening to the counsel- rs of gloom on the prospects in engineer- g turned away and sought university egrees in other subjects or, in some stances, turned away from universities together.

"By 1972 we had our peak graduation of bout 4,000 engineers in Canada. The two- ear lag undoubtedly reflected those stu- nts who were locked in the system and ad no option but to complete their egrees.

"We will reach rock-bottom by 1976 hen we likely graduate only 2,500 — at a me when the nation will be straining its ngineering manpower resources to the mit to reach our energy goals," Dr. cTaggart-Cowan said.

"This time we need not look to the U.S. r rescue "because they travelled the me stupid path," he added. "They peaked in 1972 with about 45,000 engineering graduates and will hit rock-bottom at 28,000 in 1976, which is below the replacement level. If anything, they'll be robbing us to, in part, make up their own serious shortfall."

Dr. McTaggart-Cowan said that many companies are already having to seek engineering talents abroad because they cannot recruit in Canada.

"My question to you is, how stupid can we get? How many times do we have to repeat this assinine mistake?

"We argued it out, ad finitum, at the end of the last century. We did it in the geological sciences a decade ago with the same alarming results. Do we assume that freshmen have no ears, or are we in the habit of talking before we think?

"Surely to goodness we have enough people in Canada who are dedicated to attacking ignorance that we can prevent this happening again," Dr. McTaggart-Cowan said.

Generating pact

Con Edison and six other major electric utilities in New York State have agreed in principle to form a jointly-owned electric generating company to guarantee an adequate supply of energy.

Goal of the new company will be to construct and operate generating facilities needed during the 1980's to supply a major part of the power needs of New York State residents.

The agreement is the result of a study initiated in May, 1973, to determine the feasibility of a jointly-owned wholesale generating company.

The new company, Empire State Power Resources, Inc., will be owned by the seven utilities and will provide them with wholesale power for resale to their customers. It will operate as an independent entity with a 15-member board of directors.

The study group which developed the plan says that about 25,000 megawatts of new generating capacity will be required in New York State to supply the anticipated growth in demand for power between 1982 and 1991.

The new generating company will supply about 19,000 megawatts of this total. Plans are for the construction of 17 generating units consisting of nuclear, coal-fired, and pumped storage facilities on Lakes Erie and Ontario, in the Hudson and St. Lawrence River valleys and on Long Island. The plants will help reduce the state's dependence on oil since none of the proposed units will use oil as fuel.

However, before the company can take any major action, it must obtain the approval of numerous federal and state regulatory agencies.

A major objective of the independent generating company will be to alleviate the difficulties of getting construction plans approved. All of the major utilities, including Con Edison, Long Island Lighting Company and New York State Electric and Gas have been severely hit in recent years by the rejection of plans for new generating facilities and costly delays in court.

Economists disagree

University of Chicago economist Milton Friedman is quoted in a recent issue of Electrical World as saying that no real fuel shortage exists in the U.S. He suggests the energy crisis dates back directly to August 15, 1971, when President Richard Nixon instituted "Phase I" wage and price controls.

A "free market" economist, Friedman says there is plenty of oil in the ground and the technology is available to get it out. "What is different about 1973? Why should it be that only in 1973 do you have the emergence of a fuel problem, of a problem of heating oil, gasoline, and so on?

"You've had many fluctuations in the past in supplies available. There is one thing and only one thing that is fundamentally different about 1973: price control."

He adds: "There isn't a real fuel shortage. The actual amount of fuel being

consumed is greater than it ever was. What we have is the fact that the government in Washington has said you may not let prices rise to meet the demand.

"Now it so happened that the price for gasoline was accidentally pegged at a more profitable level than the price for fuel oil, so manufacturers naturally produced gasoline instead of fuel oil. It so happens that it's more profitable to sell oil abroad than at home, so you sell it abroad. There's no mystery about that. The problem is simply price fixing which has produced the shortage."

However, Nobel Prize-winning economist Paul Samuelson has challenged Professor Friedman's stand. He argues that energy is a scarce resource and that it must be rationed directly or through the use of taxes.

He also advocates crash subsidies for liquefaction and gasification of coal to counter total dependence on Middle East oil.

"The question about oil," he says, "is what kind of free price performance would take place without controls? Will it occur at a higher plateau then at the present — but no worse? Or with an inflationary spiral?"

Samuelson says all calculations about what would happen without controls are arbitrary. Meanwhile, controls serve many purposes, including that of moderating wage increases and dampening inflation.

In the good old summertime

It used to be that everyone — utilities included — talked about the good old summertime. But at Chatham Hydro it appears they're having second thoughts.

General manager Clayt Leach says if the trend toward summer peaks continues, the utility will be forced to install more and larger distribution transformers.

"This is the second year in a row that we've had a summer peak and, in fact, the peak in both August and September exceeded the traditional yearly peak," Mr. Leach says in his annual report. He adds that summer peaking reflects the continued increase in the use of air-conditioning and general refrigeration.

Mr. Leach explains that sharply rising demands during hot summer days create more problems and overloads on the system than the same load during the winter months, "because transformers and associated equipment operate more efficiently in the cooler weather."

A modest, brave man



F.G. Topham

F.G. "Toppy" Topham, winner of the Victoria Cross in 1945 for his bravery in the Battle of the Rhine, has died at the age of 54.

Since the war Mr. Topham, a modest man who abhorred publicity, was a trouble shooter for Toronto Hydro. He was born in Toronto, and once worked as a hardrock miner at Kirkland Lake.

As a medical corpsman with the 1st Canadian Paratroop batallion, "Toppy" Topham was the second Toronto serviceman to be awarded the Victoria Cross.

On March 24, 1945, he parachuted with his battalion into a strongly defended area east of the Rhine. While treating casualties hurt in the drop, a cry for help came from a wounded man. Two medical orderlies who went to help were killed.

"Without hesitation and on his own initiative," says Mr. Topham's citation, "Cpl. Topham went forward through intense fire to replace the orderlies who had been killed before his eyes. As he worked on the wounded man, he was himself shot through the nose. In spite of severe bleeding and intense pain, he never faltered in his task."

After carrying the man to shelter, "he worked most devotedly... to bring in the wounded, showing complete disregard for the heavy and accurate enemy fire," says the citation. "It was only when casualties had been cleared that he consented to his wound being treated."

Cpl. Topham refused to be evacuated and on his way back to his company came across a carrier which had received a direct hit. He went out alone, in spite of exploding ammunition and enemy fire, and rescued the three occupants. Although one died almost immediately afterwards, he arranged for the evacuation of the other two.

His citation concludes: "This non-commissioned officer showed sustained gallantry of the highest order, for six hours most of the time in great pain. He performed a series of acts of outstanding bravery and his magnificent and selfless courage inspired all those who witnessed it."

Mr. Topham laid the cornerstone of the Sunnybrook Memorial Hospital on Nov. 1, 1945. In that same year he was received as a hero by Toronto and York township in a parade up Bay Street. Plaques were placed in schools to mark his bravery.

Although VC holders are entitled to a military funeral with full honors, his wife requested only a private funeral.

"Toppy" Topham's modesty went with him to the end.



Going, going . . .

Shades of the blitz

To the folks in the vicinity of the U.K. Central Electricity Generating Board's old Croydon A power plant, the memories were not so nostalgic when a couple of explosions levelled a pair of unused 200-foot-high cooling towers.

Many would remember other tall structures being demolished between 1939 and 1945. But this time the explosions were controlled.

The controlled explosion method of demolition, say CEGB officials, saves time and money. Each blast lasted for a fraction of a second and the towers took about four seconds to collapse. Most of the debris fell within their circumference.

Strict precautions were imposed, and to allay any anxiety an information notice was delivered to all residents living near the site.

On "D-day" morning a loudspeaker van toured the area. CEGB officials worked closely with the police, British Rail — the towers were close to a railway line — and various local government departments to warn everyone away from the area.

Croydon A has been used to produce power since 1896 and was shut down last year. The towers were constructed of reinforced concrete and built in the mid-1930's. Each tower weighed about 2,500 tons and was 140 feet in diameter at the base and 87 feet at the top.

Burp — just one for the road

Old Uncle Bill had a still on the hill....where he'd run off a gallon or two.

And if an experiment at the University of Nebraska works out, the fabled Okie in that song might even make a buck or two out of his corn likker today.

For gasahol, a mixture of 10 per cent denatured alcohol and 90 per cent gasoline, is getting a 2 million-mile road test at the university to help determine its potential as a pollution-free gasoline additive.

Last year, Professor William A. Scheller collected preliminary data from five vehicles that logged a total of 250,000 miles on gasahol and says there were "no problems whatever. We were just waiting for money to continue our experiments."

Now the Nebraska state government, hoping to create a secondary market for grain when surpluses return, has authorized $117,000 for the project. As a further incentive, it will grant a three-cent-a-gallon reduction in gasoline tax for any company that sells lead-free gasahol.

The tax incentives will help offset the higher cost. Though no-lead fuel is a few pennies cheaper to make, alcohol fermented from a $2-a-bushel corn, for example, costs 85 cents a gallon wholesale.

But with gasoline prices continually rising and grain prices expected to ease, the economics may soon tip in favor of gasahol.

And when they do, the old man with the still will no longer need to say it's strictly for medicinal purposes. Rather, he can say it's strictly for motovational purposes.

Plea for statistics

A provincial energy policy will undoubtedly affect the use of electricity in Ontario, C.H. Lusk, of Ontario Hydro's consumer service division, told delegates to the AMEU's Eastern Accounting Conference.

In a plea for additional energy-use statistics, Mr. Lusk said unless Hydro has adequate data at its disposal it will not be possible to evaluate the effect of energy policies either on the provincial grid or the municipal utilities.

"Our load-forecasting techniques are becoming more sensitive to trends in energy consumption," Mr. Lusk said. "The importance of load forecasting has been highlighted at the Ontario Energy Board

hearings. In future, it will become increasingly more important to have reliable and accurate energy-use data for improved planning of system facilities and rates.

"Surely, it is equally important to the utility in its distribution system planning? Surely, you want to know how many electric heating customers are connected to your system? Surely, the type of questions that might be asked by the Ministry of Energy are of equal importance to your utility and to Ontario Hydro?" he asked.

He added: "You might ask what is the matter with the rate class energy statistics that are now reported annually? Do they not provide an indication of future trends in the use of electrical energy?

"The problem is they do not act as an early warning device. By the time the trend to apartment living or the effect of conservation programs is reflected in these bulk statistics, it may not be too late, but certainly we have lost some valuable years during which we might have been able to more appropriately plan our system to meet the changing lifestyles and concerns of our customers.

"It is becoming more important that we have this early warning of changing energy-use patterns and such can only be obtained from more detailed and statistical information."

Fusion study sought

It is within Canada's capacity to adopt as a goal the economic production of electric power by means of nuclear fusion, says the Canadian Nuclear Association.

In a brief to Project FC — a Ministry of State for Science and Technology-sponsored study for a Canadian program on controlled thermo-nuclear fusion — the CNA says a team should be given such a goal shortly after the first demonstration of technical feasibility is achieved.

"This date, at present," the CNA brief says, "is estimated to be between five and 20 years hence. It is believed that a period of 20 years at least would be required from that date to the achievement of economic reality.

"We would like to present the thought that the AECL Labs at Chalk River and Whiteshell should play the major role in controlling and directing this project," the brief adds. "They have the background of the Candu program, many facilities, and personnel experienced in the necessary scientific fields.

"We would not like to present any opinion as to which route of the many being pursued would be the most likely to be first — or be the best. Currently Canada has, in addition to the AECL capabilities, excellent facilities and people in related fields such as lasers and plasma research. Such groups should either be subordinate or actually incorporated into the team."

The CNA calls for a study group consisting of less than 20 people to be formed within a year with the understanding that it would be the focus of Canda's efforts until the formal go-ahead is given.

Now, here's a switch

While Ontario Hydro holds public hearings and faces all sorts of opposition and delays to getting towers up, the U.K.'s Central Electricity Generating Board fought — and lost — to take one down.

A chap by the name of Ian Marr, when told of CEGB's decision to take down the 70-foot structure in his back garden, objected rather strenuously. He liked to climb it.

His reasons were simple — he liked the view and the exercise. Since the tower has been standing since 1929, the Department of the Environment told him that no planning permission was needed by the utility for a tower in that location and it could continue to decorate his back garden.

municipal briefs

*W. Sam Jennings,*long-time commissione of Niagara-on-the-Lake Hydro and a form president of OMEA district 5, has been elected president of the board of governors of the Niagara-on-the-Lake Hospita Mr. Jennings has been a member of the hospital board for about nine years.

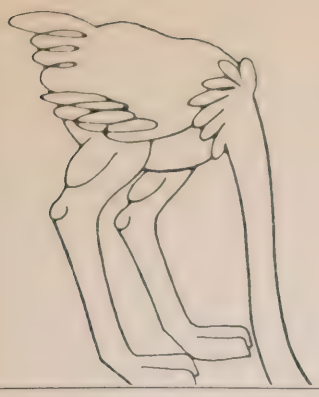
St. Catharines PUC has named Stanley H Heywood manager and secretary-treasu to succeed retiring W. Ray Pfaff. Mr. Hey wood has been the utility's assistant mar ager since January, 1971. He began his utility career with Ontario Hydro in 1938 and served as a clerk for two years befo joining the Royal Canadian Navy. After t Second World War, Mr. Heywood studie engineering at the University of Toronto and returned to Hydro as a consumer se ice superintendent in Niagara region.

*Lorne Zulauf,*28-year veteran superinter ent of Milverton Hydro, has retired. Mr. Zulauf began his career with the utility a lineman in 1946 after service overseas v the Royal Canadian Air Force.

Air pollution in Toronto continued to ab last year, Toronto Hydro says in its 1973 annual report. The report says that sulp dioxide concentrations in the air over downtown Toronto were one-seventh o the level in 1966. The utility attributes el tric heating of many of the downtown bu ings with helping to reduce pollution lev

A Toronto Hydro winter works program provided 8,000 man-days of work for pe ple who would otherwise have been un ployed last winter.

Long-time Leamington PUC commissio and former chairman Les Pridding has at the age of 50. Mr. Pridding suffered a heart attack while attending a utilities c ference in Boston.



as don wright sees it

Funny how the world manages to mud- through whatever the extent of its diffi- ties. Here's the old earth still spinning und, night following day in the usual ttern and the Argos once again on the ge of an early season Grey Cup.

It's all very unnerving to a person who ured all these things would come stuck with the advice and leadership rmally provided by this column tempo- ily withdrawn.

This is not to suggest our absence from last two issues has gone entirely unnot- d. One does not comment with perspi- city for 10 odd (mightly odd) years upon passing scene without being missed. In t, the groundswell of protest against the rruption has been so great that we felt iged to pick up our pen again even if the rld was too dumb to stop turning.

Tell us more about the groundswell, you ? Yeah. Well, the opening round was d by mother, who doesn't always read column but is fascinated by the bird h its head in the ground at the top of the ge. Somehow she's got the idea this is ant to suggest our standing at the top of pecking order hereabouts. She doesn't derstand that we are more of a peckee n a peckor.

The closing round consisted of a note of gratulation from kindly old Aunt Iso- le. She liked the change — allowing as the blank page was dandy for making grocery lists and somehow seemed re informative than the printed version.

To us, that's a groundswell and we'll k up where we left off — confining our arks to gut issues and matters of con- n to the statesmen and policy makers of nation.

■ Looking back at our last communi- e, we seem to have had quite a bit to say ut mice, and developments since that e warrant just a few more words on the ject. It's not that mice turn us on, par- ularly, but they do constitute the kind of ic upon which we can hold forth fear- sly and with some degree of impunity h from the folks upstairs and the ubiqui- s eye of the energy board. After all, o's going to make a mountain out of a mole hill? (Mice are closely related to moles).

Don't laugh. Mice can be dangerous, as witness the case of the lady who thought she had a bun in the oven. It happened in British Columbia where a badly frightened housewife called the fire department at the sight of black smoke issuing from the innards of her electric range.

Johnny-on-the-spot, if you'll excuse the commercial, the firemen soon had things under control. The oven was empty but stuffed into the side panels of the stove were about 10 pounds of dog food — baked to the point where it was burning like charcoal briquettes. Seems like Mickey and his merry men had been stealing Fido's fodder for months — looking forward, no doubt, to an all-mouse barbecue.

Not only were the firemen in time to snuff out the blaze but they solved the mystery of the skinny dog with the hollow leg.

■ Some people still seem to think the energy crisis is as simple as apple pie. Hang up our electric razors and carving knives, they insist, and the whole problem will disappear. Not according to the chairman of B.C. Hydro.

He points out that if a million familes in B.C. each bought an electric carving knife, and if they all carved continuously for 12 hours a day, they might carve up more than the world's meat supply but they'd add less than one per cent to the province's electric load.

Our own chairman has taken a poke at the electric razor syndrome. In a recent speech he said he had read that a man discarding his electric razor and returning to lather and a blade would use up more energy for hot water in three days than his electric razor would consume in a year.

■ Nothing is simple these days but we are doing our bit in at least one direction to help stave off doomsday. We refer to the threat posed by the information explosion which, according to one eminent speaker, threatens to overwhelm mankind and result in ultimate chaos.

How are we helping? The dictionary defines information as the reception or communication of knowledge. To the latter this column pleads not guilty.

■ Finally, let us shed a tear for the ladies of Listowel who are hopping mad at the PUC for discoloring their underwear. Sounds pretty ominous but it's just a little water problem.

Seems an irate customer rushed into the manager's office flourishing two pairs of ladies' underpanties. She claimed they had been discolored by rust from the town's water supply.

Rusty underwear is not among the problems listed in the utility guides but the manager promised to get to the bottom of things. □

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the cover

Spent fuel bundles safely stored on rack under water initially shed blue glow known as Cerenkov radiation at Pickering generating station. See article starting on page 2.

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hydro news, volume 61, number 6

Published by Ontario Hydro, 620 University Ave., Toronto.
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Member of Corporate Communicators Canada.
Printed in Canada.

The Management Team

Corporate office set up in line with task force recommendations



'enry J. Sissons



Milan M. Nastich



Harold A. Smith

)ntario Hydro's board of directors has stablished a corporate office to focus on ver-all corporate objectives, and a gen- ral management structure to carry out nese objectives.

"This form of organization has been elected as the most effective and adapta- le of the alternatives suggested by Task orce Hydro to meet the rapidly changing eeds of the Corporation," said Chairman ieorge Gathercole.

The corporate office will reflect the hree principal elements of Hydro's opera- ons, each with a vice-president reporting o President Douglas J. Gordon, whose ppointment was announced earlier.

Named vice-presidents are Henry J. Sis- ons — distribution; Milan M. Nastich — esources, and Harold A. Smith — engi- eering and operations.

The general management structure, esponsible to the corporate office, will be: ieorge R. Currie, general manager — egions and marketing, reporting to the ice-president distribution: W. Dennis Gill- ian, general manager — computers; rank Gomer, general manager — finance, ordon M. McHenry, general manager — ersonnel and Wendell C. Cunningham, eneral manager — services, reporting to ie vice-president resources; Pat G. Camp- ell, general manager — design and con- ruction, and Lorne G. McConnell, general manager — operations, reporting to the vice-president — engineering and operations.

For the time being, Hydro's divisions and departments will be grouped in the same manner as the functions under the present branch and sub-branch structure, with the exception of the research and system planning divisions, which will report to the vice-president — engineering and operations, and treasury, reporting to the vice-president — resources.

Many departments will be involved in specific studies to develop further organizational changes which best serve the needs of Ontario Hydro, said Mr. Gathercole.

In the announcement, Mr. Gathercole paid tribute to three senior long-service employees, Donald B. Ireland, assistant general manager — regions and marketing; Omer S. Russell, assistant general manager — personnel, and Robert H. Hillery, assistant chief engineer — operations, whose retirement was announced. (Please turn to page 30 for additional details).

Henry J. Sissons, 59, has been Hydro's assistant general manager — services since 1957. In that capacity he was responsible for supply and procurement, real estate, public relations and head office building functions. *Continued on page 24*

Pool shields nuclear fuel

Multiple barriers isolate radioactive material from the environment

by Bob Morrow

Spent fuel bundles, stored on racks under wa shield in Pickering storage bay, isolate long-lived radioactive products from environment.

"All radioactive wastes shall be managed such that the public, workers..., the environment and its resources are adequately protected against hazard."

- Hydro policy statement

A uranium dioxide fuel bundle weighing about 50 pounds stays between one-and-a-half and two years inside a Pickering reactor and, before it has to be replaced, produces as much electric energy as 400 tons of coal.

When the bundle has produced as much energy as possible, a computer-controlled fuelling machine locks on to the reactor channel, removes the hot bundle and discharges it by way of a conveyor to the station's spent fuel storage bay.

The bay looks like a large swimming pool. Here, under about 20 feet of water, the 19 1/2-inch fuel bundle initially sheds a faint blue glow, but it is safely stored. A 10-foot water cover offers the same protection against gamma rays as five feet of concrete or one foot of lead shielding.

Water also provides the best cooling medium. When discharged to the bay, the bundle gives off about as much heat as four burners on an electric stove. A year later, however, it will produce only about as much heat as two 150-watt light bulbs.

What has been described is the first step in managing spent fuel containing radioactive wastes in a Candu station. Spent fuel also contains plutonium, a potential fuel, so it's not entirely without value. The fuel bundle sheath, made from a nuclear age alloy of zirconium, is a primary barrier between hazardous material and the environment.

All long-lived radioactive materials are locked up within the zircaloy-sheathed fuel pencils. Even in the rare event of a fuel bundle failure, more than 99.9 per cent of the radioactive material remains in the sheath. Another safeguard is the uranium dioxide pellet itself. Made of ceramic material, the pellet binds together the radioactive by-products of nuclear fission.

Underwater inspection through a periscope shows that only a very few bundles are damaged despite the long irradiation. (Only 98 sheathing defects have been found in 37,500 fuel bundles.) When a defect occurs, the fuel bundle is "canned" in a stainless steel cylinder to prevent escape of fission products into the storage bay.

The storage bay, made of double-walled, steel-reinforced concrete, is located within the main structural concrete of the reactor auxiliary bay. The inner wall is lined with epoxy to prevent leakage of water. But if any water seeps through it is drained away for cleanup and returned to the bay.

Storage bays effectively isolate long-lived radioactive products from the environment, but they are only intended to serve for relatively few years. Pickering and Bruce generating stations, for example, will have sufficient capacity with proposed additions to serve until the mid-1980's.

But the Canadian nuclear industry has recognized from the outset that long-term storage, perhaps for thousands of years, and surveillance of spent fuel are essential.

With this in mind, Atomic Energy of Canada Limited, Ontario Hydro and Hydro-Quebec have done and are doing considerable research on the problem of storage over the longer term. A preliminary 16-month study was completed last February, and Ontario Hydro engineers have since launched a more detailed investigation. Early work many years ago at Chalk River Nuclear Laboratories proved out the feasibility of solidification processes such as fixing wastes in glass.

Canadian nuclear power stations have an excellent safety record. But just when success of the much-needed technology as a reliable energy source seems assured, three misconceptions about radioactive wastes have arisen.

The misconceptions are:

* Vast quantities of waste will be produced
* Storage will prove too costly
* Solutions other than dumping are non-existent.

In fact, the volume of waste can be kept in a relatively small space, storage represents only a small fraction of the cost of generating electricity and a number of longer-term storage methods are being developed.

Uranium dioxide fuel, a remarkably co centrated source of energy, produces a small volume of waste materials. AECL estimates that by the year 2000, when nuclear power stations are expected to generate about 50 per cent of Canada's electricity, all the spent fuel would cover three city lots 100 by 100 feet up to a height of 30 feet. Additional space will b needed, however, for heat removal.

(Even the much larger U.S. nuclear p gram will produce a relatively small volu of wastes. It's estimated that up to the ye 1990 the U.S. could store as solids all ra oactive wastes from reactors producing 80,000 megawatts in less than 400 acres

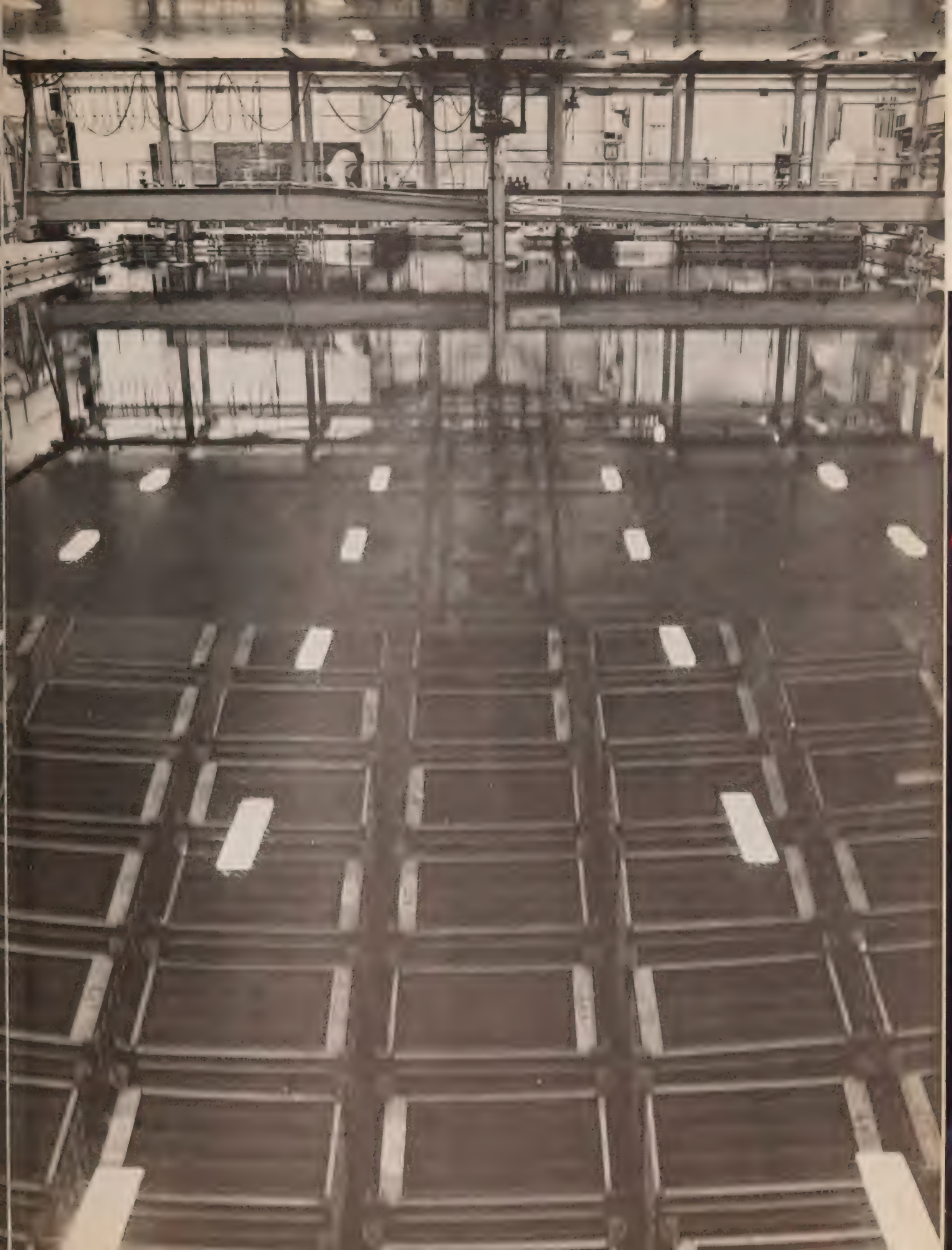
As for expense, the management of Canadian spent fuel has been estimated only 2 to 3 per cent of the energy cost. T overall cost would be reduced, however a value were assigned to the plutonium contained in spent fuel.

Because of its potential value as fuel, plutonium will be too valuable to waste. About 58 grams of the fissionable isotop are produced along with other by-produ in each of Pickering's 4,680 spent fuel b dles during their reactor stay.

When sufficient accumulates, it may become economic either to sell or recyc plutonium. Such recycling will not only control this hazardous substance but al conserve uranium resources. But, in the meantime, Pickering's spent fuel bay co be considered as a plutonium mine, or depending on future markets, as money the bank.

In a paper presented to the Canadian Nuclear Association in 1973, three poss longer-term storage methods for spent f were outlined by W.M. Campbell of AEC Dr. Campbell said guidelines would gua antee that spent fuel is under control at times and that it can be recovered and reprocessed when necessary.

"The term 'disposal' .... has no place the Canadian program," Dr. Campbell t the CNA. "Disposal" implies an accepta method of non-retrievably getting rid of



wastes that cannot be dispersed. .... our policy is one of retrievable storage."

Three good methods are storage in water-filled bays as at present, dry storage in a specially engineered concrete structure or geologic storage.

Retrievability and surveillance would be essential features in each case. If necessary, radioactive material could be repackaged or transferred to protect the environment.

In an engineered building, natural circulation of air would provide inexpensive cooling for the dry storage method. Fuel bundles would be welded into stainless steel pipes or cast into metal blocks to provide a secondary barrier against the escape of radioactivity.

In geologic storage, rooms would be mined out of a salt bed. Fuel bundles welded into metal cans could be stored in holes in the floor which would be closed with shielding plugs. In time, salt mines might be used for permanent storage if sufficient confidence develops in their safety, said Mr. Campbell.

Some experts believe geologic storage will prove to be the longer-term solution.

Considerable research has also been done in Canada and the United States on ways to solidify waste in glass-like substances. A recent development uses a polymer to solidify wastes in plastic. Another technique in use is incorporation in asphalt.

With the Candu system and our present policy of retrievable storage and with the work that has been done and is going on to assure that wastes will be isolated from the biosphere, Canada has the opportunity to take the time to select the optimum method of finally disposing of high-level wastes. A number of options will be available when that decision is necessary.

But what about other sources of radioactivity, apart from spent fuel?

A nuclear station uses defence-in-depth methods to protect workers and the public against all radiation hazards. These include shielding, controlled ventilation, containment systems, automatic monitoring and alarm systems. Potentially hazardous effluents are monitored and controlled to very low levels.

These precautions have been so successful that it's difficult to distinguish any change in radioactivity levels around a nuclear plant. Annual exposure of a person living in the neighborhood has been estimated to be less than what an airline passenger would receive from cosmic rays on a round trip flight between Toronto and Vancouver, and much less than the exposure from a chest X-ray.

In addition to spent fuel, Hydro policy requires careful storage of other radioactive wastes — accounting for far less than one-tenth of 1 per cent of the total — to protect the public, workers and the environment. For this purpose a 1.4-acre waste storage area has been set up in a secluded area of the 2,300-acre Bruce Nuclear Power Development, which also embraces the Bruce and Douglas Point nuclear stations and the Bruce Heavy Water Plant.

Bruce is one of two main storage sites in Ontario. The other is at Atomic Energy of Canada Limited's Chalk River research centre. The Atomic Energy Control Board sets strict standards and grants licences for nuclear power stations and radioactive waste storage sites.

What wastes are stored at Bruce and how are they managed?

The largest volume consists of lightly contaminated material, including paper, rags, mops, radioactive components and pieces of scrap such as valves and pipe fittings. As well, protective clothing worn by workers, including rubber overshoes, gloves and plastic suits, are stored as radioactive wastes when their useful life ends. As an added precaution, all waste material coming from the station's radioactive zones is considered to be contaminated and goes to the storage site. (See Radiation Protection — A Way of Life, Hydro News, May-June, 1973).

These low-level wastes, however, contain little radioactivity. They are stored in steel-reinforced concrete trenches lined with heavy polyethylene sheeting, capped with reinforced concrete, and sealed to keep out water.

To reduce bulk refuse, federal and pr vincial regulatory authorities have approved installation of an incinerator a Bruce with filtration equipment designe minimize atmospheric discharge of radi active particles. By reducing the volume low-level waste, this equipment will perr more efficient use of trenches on the cc pact site.

More than 90 per cent of the minute amount of radioactivity that is not contained in the fuel bundle is captured in t ters and ion exchange columns. This purification equipment removes small amounts of radioactive material coming from the few small defects in the sheath ing, and circulating corrosion products such as metal particles activated by ne trons inside the reactor system.

The filters remove insoluble particle Ion exchangers contain sand-like resin that soak up dissolved solids as water p ses through. When the resins and filter are saturated, they are replaced.

These intermediate-level wastes are placed below ground in vertical concre tile holes, 12 feet deep, set on concrete slabs. Two filters or columns are usuall placed in a tile hole, which is then filled and capped with 10 inches of concrete.

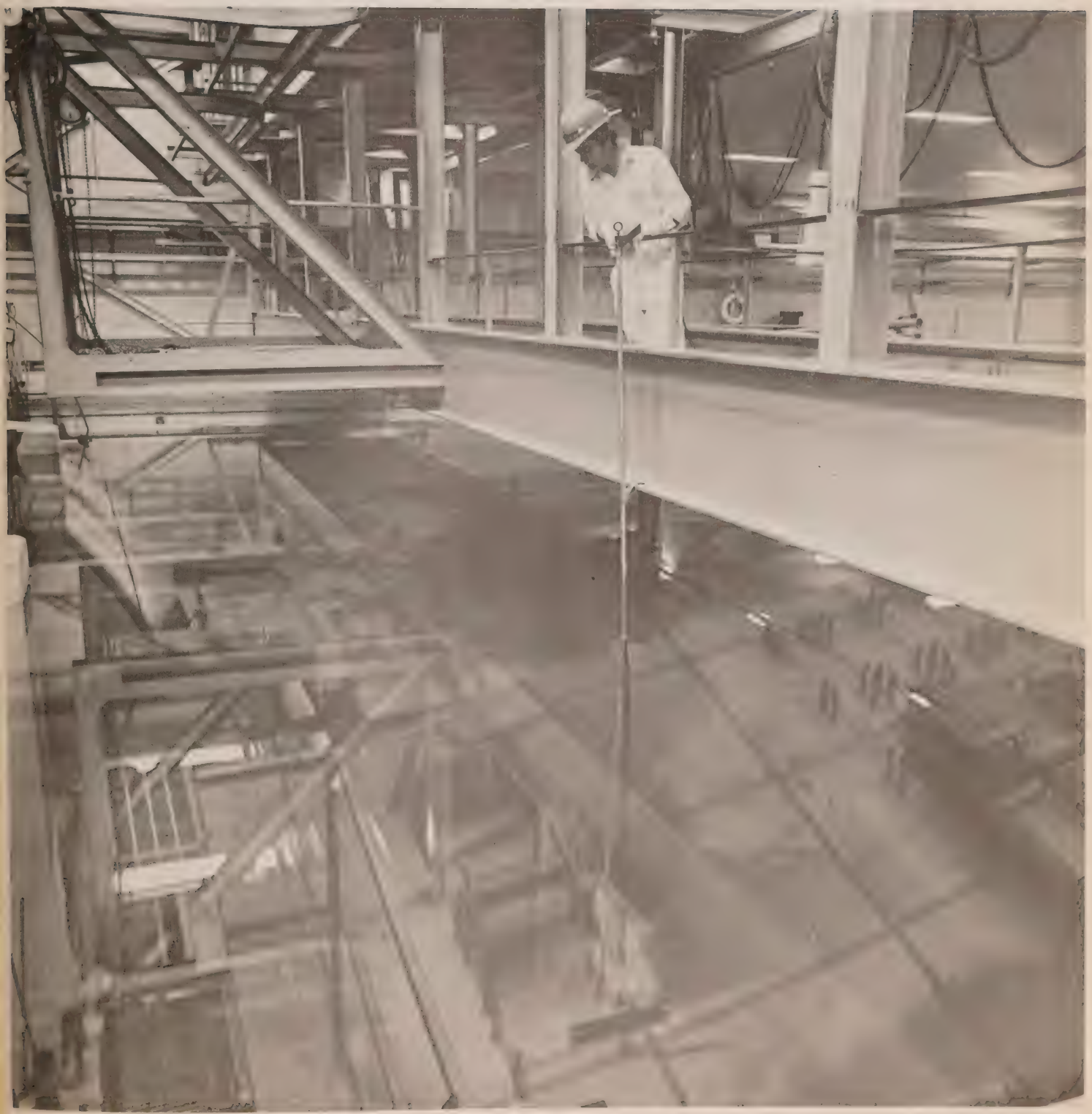
The Bruce storage site was carefully chosen with the approval of the AECB extensive geotechnical studies. It is re from a large population centre and ma sources of drinking water.

Wastes stored there are dry solids, an added safety feature is soil of a type will absorb radioactive materials if any water contacts the stored wastes.

Thus the site provides multiple barr to prevent the escape of radioactivity t biosphere — metal, plastic or wooden tainers, concrete barriers, waterproof ing or polyethylene liners, and desirab soil known as impervious glacial till.

Sample wells have been sunk close the trenches and tile holes and along site boundary. If any serious or signifi escape is detected by sensitive instru ments, the radioactive material could retrieved and stored in another concr trench or tile hole. In fact, continuous

rradiated fuel bundle is manoeuvred under
vater for storage on racks.



Crane removes heavily-shielded flask contain radioactive material from special transport truck for storage in concrete at Bruce site.



toring and retrievability of wastes are conditions of Ontario Hydro radiation protection regulations and the AECB cence.

The radioactive storage area must be closely monitored and controlled because Ontario Hydro regulations govern emissions from the entire Bruce Nuclear Power Development, including the Douglas Point nd Bruce Stations, and limits for the entire project are unchanged despite location of he storage area there. A person would ave to stand at the storage boundary ence for more than 100 years before eceiving the maximum annual amount of xposure permitted to a member of the ublic under federal regulations, which ontain a wide safety margin.

AECB transport regulations also govern hipments of wastes from Pickering to the ruce storage site to ensure radioactivity ill not escape in the event of a serious ighway crash. Low-activity waste is carried in 45-gallon stainless steel drums — nown as Type A packages — which must ithstand a free drop of four feet, water prays, compression and penetration tests.

The six-ton Type B packages used to hip the more active spent ion exchange olumns and filters are heavily shielded asks designed to pass severe torture tests ithout leaking. These include a drop of 30 et on to an unyielding surface, a penetraon test, subjection to a 1,500-degree F. re for 30 minutes, and submersion in 45 et of water. Stresses experienced in ese tests are greater than would occur in serious highway collision.

For highway transport, shipping casks e carried inside double-walled steel coniners specially designed for the job. Dur- g 1973, 24 spent columns and filters were hipped from Pickering to Bruce, and are ow solidified in concrete in a dozen tile les at Bruce.

To sum up, fuel storage bays keep more an 99.9 per cent of the radioactive astes contained in fuel bundles isolated om the environment. Hydro will have stor- e capacity at Pickering and Bruce staons to suffice until the mid-1980's.

Several methods are available for longer-term storage. Costs are important, but safety is the overriding consideration. Along with AECL, Ontario Hydro is engaged in intensive studies to determine the optimum methods of storing spent fuel and other solid wastes indefinitely.

When the need arises in the next decade for longer-term storage and ultimately for disposal, detailed plans and procedures will be ready to protect the public, workers, the environment and its resources against hazard. This will be done in a manner which ensures wastes are isolated from the biosphere so that future generations are protected. □

All that electricity gone for nought

Copper strips ground world's tallest lightning rod

When a building has the potential to be struck by lightning 200 times a year, not just any old lightning rod will do — especially when that building will house some of the world's most sophisticated communications equipment.

But that was one problem faced by the builders of the 1,800-foot CN tower in downtown Toronto. A single lightning stroke could wreak havoc with the entire communications system atop the world's tallest free-standing structure.

The answer, of course, was to call in the experts. The lightning protection system was designed by Ellard-Willson and Associates, a consulting engineering firm, in association with Marc G. Theriault, of Electro-Protection, Montreal. Experts from the CBC and the Ontario Fire Marshal's office were also consulted.

The system itself was installed by Dominion Lightning Rod Co. Ltd., a family firm founded in Dundas in 1898. The company is headed by D. P. (Bud) Cliff, better known around utility circles for his work with the Ontario Municipal Electric Association and as a commissioner and former first vice-chairman of Ontario Hydro.

Bud's brother, Ted, is the company's secretary-treasurer and Ted's son, George, is its vice-president. Bill Cliff, Bud's son, was the firm's representative on the project.

The Cliff firm was invited to tender on the CN tower system because of its experience in building lightning protection systems for a number of landmarks, including the Toronto Dominion Centre and the Skylon Tower in Niagara Falls.

The lightning protection system is basically three copper strips running up the inside walls of the structure's hexagonal core. The strips are linked together by rings of copper, placed at 100-foot intervals around the core. The stairs, elevator rails, window mullions, sewer and water

Lightning bolts etching night sky during construction of CN tower illustrate need for protection system.

Photos: CN and Toronto S







With an ultimate height of more than 1,800 feet CN tower has already dramatically altered the Toronto skyline. It will be world's tallest free-standing structure.

pipes, are connected to the system.

To ground the world's tallest lightning rod, 42 rods, each 20 feet long, have beer placed around the tower's base 20 feet below grade.

Toronto Hydro will supply primary power to the structure at 13.8 kV. Three 1,500-kVa transformers are located at the lower level and 13.8-kV cables run 1,200 feet up to the seven-storey sky pod where four 2,000-kVa transformers will be located.

As a safety measure, the cores of the upper-level transformers are immersed in non-flammable fluid instead of the usual transformer oil.

Although three separate feeder cables provide security of service, stand-by dies generators will be installed for emergenc use.

One of the biggest problems in supply ing electricity to the structure which will have a total load of 10,100 kilowatts — larger than most towns in Ontario — was the limited amount of floor space aloft to house the transformers. Bern Brenner, manager of Toronto Hydro's distribution planning and design department, says more engineering time than usual was required to solve the space problem.

Antennae will be enclosed in a fiber-glass radome to prevent icing. Synchron-ized lighting at the top and bottom of the outside elevators will give the effect of a rocket launch when the cars are ascend-ing, and a comet falling when they are descending.

The tower's aircraft warning lights are unique, too. It will be the first time strobe lighting has been used in Canada for this purpose, and with 200,000 candelas, the will compete with the sun during the day-time. During the bird migratory season, these lights will flash only five instead of times a minute to prevent temporary blin ness in birds approaching the structure.

When it's completed, the tower will be set in parkland with landscaped terraces sloping to a reflecting pool. With its shop boutiques, observation and dining faciliti and glass-enclosed exterior elevators, th tower is destined to become one of the world's tourist attractions. □

Never a dull moment

Property agents use tact to cope with wary owners, farm dogs or a cranky horse.

by John Dalrymple

Every occupation has its hazards, and those who would succeed soon learn a lively respect for them.

For Ontario Hydro's property agents, familiarly known as PAs, each day brings a new miscellany of unpredictable hazards, but the one they most respect is the "farm dog". A ubiquitous beast, almost invariably part collie by mixed lineage, part bull terrier by persuasion, it is endowed with an insatiable appetite for the back of a stranger's leg.

Hydro property agents — about 60 of them work out of Toronto and various regional offices — are themselves an extraordinary breed. They have the cold, appraising eye of an accountant, the mental flexibility of a UN diplomat, and a heart full of old-fashioned sentimentality — somewhat jelled by a hard shot of bitter cynicism.

Their job is to acquire the various property rights Ontario Hydro needs for generating, transmitting and distributing electric power across the province. Their daily contacts range from sophisticated Bay Street lawyers to tough-talking truck drivers to quiet backwoods farmers.

One thing they universally hate is farm dogs.

Of course, like mailmen, Hydro's PAs are issued a spray-can of dog repellent along with their Hydro identification card. Few of them ever carry it, and practically none have ever used it.

It's hard enough to establish a neighborly negotiating rapport with an owner, "bout that couple of needed acres on his back forty", without having the farm dog streaking off in your direction. But if worst comes to worst — and it often does — a little blood and a torn pant leg establish the human bond better.

Ontario Hydro's property acquisition policies call for the fullest public information about proposed transmission routes, and major public participation in the decisions made. Hydro's property agents are mainly responsible for co-ordinating this public input, and finally responsible for the face-to-face negotiations with individual owners for property rights along the route chosen. They rarely have dull days.

"You never know what's going to happen each time you knock on a door," one PA explained. "You never know what's waiting for you when it opens."

In some cases, they are greeted with open arms by an owner who says: "I've been trying to get rid of that stretch of rock for years." In other cases, it may be a trembling oldster and hysterical wife, three generations on the land, who still remember when "Grandpa cleared it from the wilderness — and there is no way you are moving us now!"

"Some of these people are legitimate," one PA sighed. "They aren't the least interested in the money, even though we are offering top value. We could offer triple the price, and they wouldn't care. They have their roots sunk there."

Appraisers can assess the book value of a farm operation. But what is the price of a tree, or a family memory?

"I'd rather deal with an irate owner anytime than with a sentimental one," another PA agreed. "If he reaches for a shotgun or a pitchfork, you know what to do — you run, and then send one of your good buddies back next week to calm him down. When you run into real tears, you take them home with you."

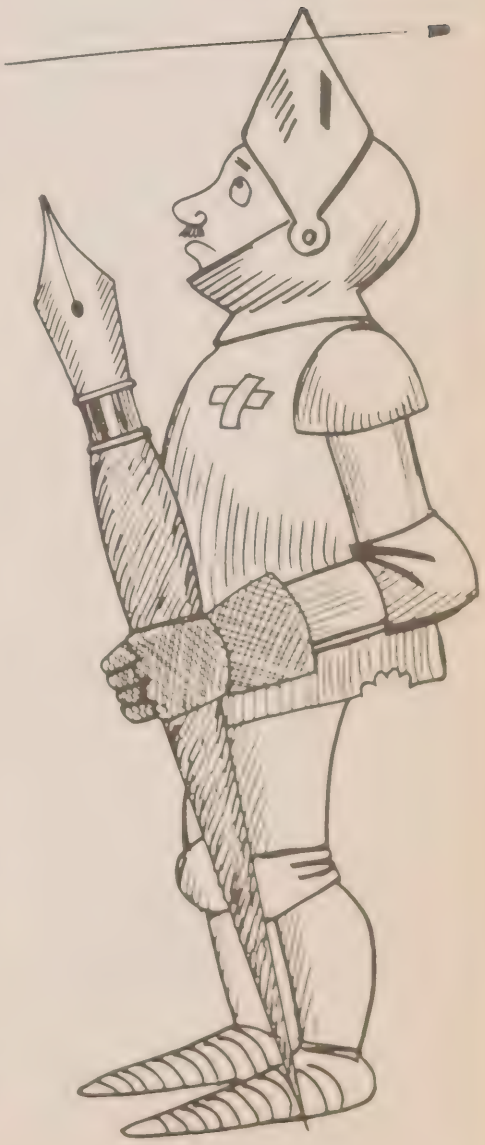
Of course, crocodiles cry too.

One agent recalls the purchase of two adjoining farm properties, the lands and brick houses "as alike as two peas in a pod," and appraised within $200 of each other.

The agent went out one afternoon to negotiate with the first owner. After three hours of talking he finally won reluctant agreement.

"He was crying when he signed. The tears were literally running down his cheeks and dropping on the contract as he told me how much this little farm meant to him. We were paying top dollar — but I still felt awful."

The agent drove to a restaurant and managed to swallow a few bites of supper. Then deciding he might as well pack all the misery into one day's work, he drove back to negotiate with the neighbor. He knocked and introduced himself, expecting the worst.



"Never mind the song-and-dance," the neighbor said, hustling him inside. "Just give me the same deal you gave my friend down the road. I'll take it."

"Oh?" said the bemused agent, who still hadn't had a chance to detail what he was offering.

"Sure," the owner replied. "Your car was hardly out of his driveway before he was over here waving that piece of paper and prancing all over my living room showing me what he got. Give me the same, and it's sold."

The agent promptly did, and the owner promptly signed.

"Makes you a little cynical sometimes," the PA sighed.

On the other hand, there are many genuine cases of deep-rooted fears of change, and wild anger. During negotiations, agents are on the alert for symptoms of physical and mental stress.

Faced with owners who seem legitimately distraught, agents generally try to cut the interview short, in friendly fashion, then return at a later and hopefully, calmer time.

In one case, two agents were explaining Hydro's property needs in the kitchen. As he listened, the owner's face began sweating, then turned a bright purple. Suddenly a stream of blood gushed from his face across the neat kitchen table. He'd burst a blood vessel in his lip, from anger. After giving rudimentary first aid, the agents adjourned negotiations for a couple of weeks. When he'd calmed down, he signed the agreement amicably.

Despite agents' best endeavors — and they are frequently heroic — some agreements are never entirely amicable, some owners never entirely convinced the deal is fair.

Up in the Bruce Peninsula, there is one lady thoroughly convinced that her daughter is sterile, entirely due to nearby high-voltage lines. No amount of engineering argument or scientific research can convince her otherwise.

After all, she notes, the Bruce generating station is a nuclear plant, and all that nuclear electricity is streaming right over her farm. And everbody knows what atomic radiation does to people — to say nothing about her herd of Hereford cattle. In such cases, agents do their best, then pass on to the next problem, real or fancied.

Many strange and groundless anxieties often work themselves into otherwise straightforward negotiations, to the baffle-ment of PAs. Some farmers have claimed "risk pay" on the grounds that they — or even more importantly, their cattle — might be electrocuted by touching a wire fence near a transmission line. They acknowledge they've never heard of such a case, but it's a negotiating point.

Strange and unspoken yearnings can also plague property negotiations. One agent recalls spending tedious hours on a minor property deal trying to convince the owner that $750 was the very best possible price Hydro could pay for a half-acre slice from the back of his farm. The owner admitted it was an excellent price, but insisted for no explainable reason that he wanted more money.

Finally, one midnight, he yielded, signed and asked his wife to serve tea.

As she poured it, he sighed and said: "Well, dear, I guess we didn't get it." She nodded sadly. It turned out that while the agent had been negotiating on the basis of the appraised value of the farmland, the owner had been negotiating on the basis of the $950 retail price for the color TV set he'd promised his wife.

Agents need to keep their guard up at all times. In one case, an owner offered $5,000 demanded $7,000. Months of dickering went by while both Hydro agent and owner stuck to their figures. Finally, the owner suggested $6,000. The agent insisted $5,000 was tops.

"Well, we could split the difference," the owner said. "Could you get me $5,-500?"

Back at head office, the agent finally managed approval for the extra $500. Back he went."

"Good news!" he chortled. "I can now give you the $5,500 you wanted."

"No way!" the owner replied. "I just asked if you could get me $5,500. I didn't say I'd take it. Now I know you can, I'm still firm at $7,000."

Months later, the agreement was clos at $5,500.

Even after negotiations are done, it is often the harassed property agent who is summoned to "fix things" when later disa greements arise.

One owner refused access to his land a construction crew. While 15 men and $200,000 worth of equipment stood idle i front of the barred farm gate, a property agent climbed wearily into his car in Toronto and drove 300 miles to find out what the problem was.

It seems the man had some trees — about six ash, a few elms and couple of poplars. He didn't figure they were included in his compensation. After final pinning down the complaint, the agent d agreed. But he asked what the owner thought his trees were worth. The answe $500.

"Those trees might have been worth $150 — if you could find a lumber company to bother taking them out. But with those men and all that equipment standi there, and the meter ticking away at Goo knows-how-much an hour, I said okay. W shook hands. He opened the gate."

In another case, a disgruntled farmer noted a group of Hydro surveyors stand in a knot on one of the fields he was abo to fertilize. As his tractor chugged past, temptation overcame him. He turned on the spray, and scored a direct hit with several gallons of liquid manure.

Understandably, the survey party flee and refused to return until peace had be made. So a property agent drove a few hundred miles to pinpoint the problem, guarantee redress for the owner's griev ances, and extract a promise of better f lizer control in future.

Property agents have been stranded midnight blizzards miles in the backwoo (one in the centre of an unmapped strea caught in the midst of family arguments (one team left abruptly when an owner belted his wife off the living room couch interrupting discussions); drunk full tum blers of homebrew (after-hours, of cour as the final condition for sealing a deal; helped routinely in home and farm chor like calving a cow or shoeing a horse.

A fair deal

New land acquisition policies designed to ensure fairest possible settlement

Actually, the "farm chore" bit makes little mileage in signing property deals, most agents have learned the hard way.

One PA recalls a blacksmith coming around in the middle of negotiations to shoe the owner's particularly ugly black stallion. He went out to watch. As things got tough, he volunteered to help. Eventually, the stallion had to be tied, wrestled to the ground, and he was shoed with the agent sitting on his head.

Two hours later, his shirt ripped, his trousers filthy, but the stallion shoed, he returned to the kitchen negotiating table, confident of appreciation.

Good old "neighborliness" lasted for one cup of coffee. Then it was back to "business." And the business at hand had nothing to do with shoeing horses. It took six months to close that deal.

For property agents, there are good days and bad days. One of the happiest days one agent recalls involved a farm dog he hated.

He'd been out several times, negotiating, standing in the farm yard, his hands full of survey plans. The owner, a farmer in his 70s near Kingston, obviously enjoyed the prolonged dickering, especially the antics of the agent who kept dancing around protectively as the farm dog, belly to the ground, constantly manoeuvred for a chance at a rear attack.

One negotiating day, a passing cattle drover came by to look at one of the farm cows. The farmer waved him to the barn. As the drover rounded the corner, the agent's four-legged nemesis charged at him. The drover's booted foot lifted and catapulted the dog into a triple somersault. The dog went howling off. The drover didn't even break stride or look around. The farmer didn't raise an eyebrow.

"I'm basically a nice guy," said the PA. "I like kids. I like dogs and cats. I give to charities and the Humane Society. But that day — I have to admit, I felt good."

"What's more, the owner signed." □

Designed to ensure land-owners, and especially farmers, the fairest possible settlement where land rights are needed by Ontario Hydro for power transmission lines, the Corporation's property acquisition policy quidelines grew out of hundreds of public meetings and conferences with farm groups and other agencies.

Now being applied generally across the province, the property program provides for maximum public participation in choosing possible transmission line routes and keeping local inconvenience to a minimum.

- All owners receive all the protections set out in the Ontario Land Expropriations Act, guaranteeing them many tax, interest payment, legal and appraisal benefits. There are extra payments to compensate for "disturbance" to farm operations.
- While all Ontario Hydro's needed property rights are to be acquired in ways set out by the Expropriations Act, Hydro will still continue to negotiate individually with owners during the process. This should combine the flexibility of private bargaining with the rigid legal guarantees owners have under the Act.
- Hydro guidelines invite the broadest local participation in shaping the final route of new transmission facilities, including a full public information program and a series of public meetings at which residents can give their comments, criticisms and recommendations at various stages of planning. Hydro supplies maps and questionnaires so residents can pinpoint historic sites and special scenic attractions or community uses that should be avoided.
- Owners, generally, get three clear options on the sale of property rights: to sell the property outright; to sell an easement to Hydro for a lump sum; to sell an easement for an annual payment to be adjusted regularly to reflect changing land values and money costs.
- Reluctant owners have a right to demand a provincial government inquiry to determine if acquisition of their property is "fair, sound and reasonably necessary" for the project to proceed.
- Owners are entitled to reasonable legal and appraisal expertise, normally at no cost to themselves.
- Early in the process, owners receive a statement of Hydro's evaluation of the compensation they can expect, under each of the options available to them, so they have a sound basis for judgment.
- Where feasible, Hydro personnel will try to arrange minor site adjustments to minimize inconvenience.
- On expropriation, Hydro immediately offers owners 100 per cent of Hydro's evaluation of the land rights — without in any way prejudicing their right to seek greater compensation through further negotiation, informal conciliation or formal arbitration hearings.
- Hydro will usually try to expropriate only minimum easement rights to a property, while still leaving the owner the option to sell the entire affected property to Hydro outright. □

Plug-in trains?

To electrify or not to electrify: a costly question facing Canada's railways

by Rae Hopkins

Sleek electric train from the Trans Europe Express railway's fleet sweeps past Chillon Castle in Switzerland.

High prices for diesel oil together with the possibility of future shortages are leading some of Canada's railway experts to take another look at electrification.

But at the moment, they're approaching the idea with extreme caution.

Says Robert Klein, CP Rail's director of technical research and development, railways studying electrification must assign priorities to the numerous railroad improvements they have before them.

"At CP," Mr. Klein says, "electrification sits there somewhere on the list — certainly at this time not at the top, and equally certainly not at the bottom."

And a spokesman for CN, John C. Noel, manager of public relations in Toronto, says electrification is "something the railway has looked at in the past, but at present there's no move in that direction. Costs of conversion are absolutely staggering."

But despite the caution, CP has built a quarter-mile test section of overhead catenary — the electrical structure that would transmit power to electric locomotives — at Ross Peak, in the Canadian Rockies near Revelstoke, B.C., one of the bleakest spots in Western Canada.

Although the section has not been energized, it is fully equipped. Mr. Klein says the test has a two-fold purpose: to study the cost and degree of difficulty in erecting a catenary under North American mountain conditions, and to assess the effects of a severe winter on the structure.

Annual snowfall in the area frequently exceeds 500 inches and snow slides are common.

Mr. Klein says the railway "fully expects to have difficulty with the equipment, but that's precisely why we chose this area. These would be the most difficult conditions we would encounter in the eventuality of electrification."

He adds that if CP decides to proceed with electrification of the Calgary-to-Vancouver section of its main line — the section touted to be electrified first—the experience in wintertime repair and maintenance of the catenary will be invaluable.

Building of the test catenary followed a series of exhaustive tests in 1971 by a team of CP researchers in Norway using electric locomotives on mountain lines where conditions are similar to those in the Rockies.

Electrification, of course, is nothing new. Most railways around the world have turned to a greater or lesser degree to electrification since electric energy became commercially available at the turn of the century. CN's Montreal terminals, for example, are all equipped for electric railway operations and the now-defunct Montreal and Southern Counties Railway, a subsidiary of CN, was an electrified railway which brought passengers from the Montreal suburbs to city centre.

But it's in Britain, France, Germany and most other European nations and Japan that railways have moved extensively into electric locomotives over a high percentage of their railway systems.

European railroads, says Mr. Klein, started life with steam locomotives, made a somewhat half-hearted transition to diesels, and then in the post-war period moved extensively into electric locomotives.

The move from steam to electric locomotives in Europe "is reasonably logical when some of the pertinent factors are considered," Mr. Klein adds.

"For example, there are vast hydrocarbon reserves in the form of coal which was readily used as a fuel for steam locomotives and, of course, can readily be used — provided environmental constraints are met — for the generation of electric power.

"And until recently, there were virtually no known sources of hydro-carbon fuel in the form of crude oil in Europe."

The destruction of existing railway systems during the two world wars gave added impetus to redevelopment.

"But," says Mr. Klein, "looking at North America we find a somewhat different story. Steam locomotives were operated throughout the continent, firstly fuelled by coal, and subsequently by oil. When the diesel-electric locomotive was perfected shortly after the end of the Second World War there was a massive shift to this form of motive power in North America."

He estimates that 98 per cent of all the locomotives operated in Canada and the U.S. are diesel-electric. Borrowing sophisticated mass-production techniques from the automotive industry, a high level of standardization and low cost per horsepower was achieved.

"Of course, there are vast coal reserve in Canada and the U.S., but viewing the s uation from the vantage point of the mid-1940's, and early 1950's, there appeared be a limitless supply of crude oil. And No American railroads were spared the cost damage of the two world wars.

"In my view, under the circumstances that prevailed on the two continents, the basic decisions made by the Europeans and by the North Americans were both sound and effective," Mr. Klein says. "Ce tainly the transition in North America fron steam to diesel provided a quantum jump in the performance, reliability and capaci of our railroads.

"But this puts North American railroad in a position where in the last four or five years they have invested hundreds of millions of dollars in upgrading and increasi their locomotive fleets by purchasing higher horsepower diesel-electric locom tives. As a rough estimate, there are som thing like 3,700 diesel-electrics operating in Canada today.

"An average replacement cost of eac locomotive would be about $500,000, therefore replacement value of the fleet would amount to $1.85 billion and who's say the electric locomotives will be availa ble at any bargain prices?"

However, CP Rail's senior executive officer, Keith Campbell, says interest in electrification in North America is probal greater now than at any time.

Mr. Campbell says there is a question mark concerning further development o the diesel locomotive. "We've reached something of a crossroads. In hauling fa freight the needs of the market dictate th to maintain competitive schedules, railways should use four, five, or even six locomotives of 3,000 hp or more.

"Where bulk freight is concerned, the need to minimize unit costs has led man



Although not energized, CP Rail has built a quarter-mile test section of overhead catenary at Ross Peak in the Canadian Rockies to determine how it will withstand the extremities in weather conditions. The area gets close to 500 inches of snow a year.



railroads to operate very long trains sometimes requiring as many as 12 such locomotives. There is nothing inherently wrong in this, yet somehow such an inelegant solution suggests that railroads have reached a technical plateau."

Efforts on the part of railway researchers to increase locomotive output by using more than one low-speed engine a unit have not been sufficiently successful to obtain widespread acceptance. No more successful have been experiments to use high-speed diesel engines of the type often used in Europe.

"The way ahead for the diesel locomotive is not readily apparent, and the demand to generate more and more horsepower seems to have resulted in high maintenance costs and a decreasing level of dependability," Mr. Campbell says.

Traffic volume on some North American main lines already compares with densities used in Europe to justify electrification. By 1980, it's expected that tonnage on CP's single track through the Rockies will rise to between 35 and 45 million tons. This exceeds the tonnage moved on the electrified four-track route between London, Liverpool and Manchester.

But one of the major reasons against electrification is the cost of conversion, which Mr. Campbell estimates at about $50,000 per mile of track. "I don't suppose there is any major railroad in North America that could convert to electric traction within a decade without substantial injection of external funds."

Despite the caution expressed by his colleagues, Glen T. Fisher, CP Rail's director of special projects, feels the nation's first electric main line railway could be developed within 10 years — possibly seven.

Mr. Fisher, the man originally responsible for directing CP's tests and studies on electrification, further suggests that all main and higher-density branch lines in North America will be forced to switch to electricity before the turn of the century because of fuel pricing and supply.

Electrification has made impressive advances both economically and in technology over the last 20 years. Mr. Fisher says these changes are among the factors making a new look at electrification more than "just a fad."

Most important of the technological developments is the solid state rectifier. While early electric railways had to operate with low-voltage direct current which was ineffective and expensive, it's now possible to use high-voltage commercial frequency AC and to transform and rectify the power on board the locomotive using solid-state rectifiers and thyristors.

Some AC locomotive designs have been in operation for 60 years, although they required special low-frequency AC at 16 2/3 Hz or 25 Hz.

These AC designs were more efficient than the DC systems, but still called for special traction motors, extremely large transformers and tap-changing switches to control motor current.

To complement the development in locomotive technology, new standards for catenary supply systems to feed the locomotive from an overhead wire energized with high-voltage commercial power have been developed.

Britain, France, Russia and Japan ha all standardized on 25 kV, 50 Hz power f new electric railway construction. Compared to the old 1,500-volt DC systems v their expensive track-side converter sta tions and heavy overhead wiring, these kV systems are a dramatic advance in e ciency and cost-reduction.

A new system has been put into oper tion in the U.S. using 50 kV for the first t to power the 78-mile Black Mesa and La Powell coal-hauling railroad.

Aside from power supply, there have been significant advances in the mecha cal and electrical control systems of the locomotives themselves. These include improved suspension systems and extremely large traction motors.

J.A.R. Service, an engineer in Ontari Hydro's system planning division, says railways first approached Hydro separa about 10 years ago about electrificatior their respective Toronto-to-Montreal lin but then the issue appeared to die.

Discussions have since been held w CP on the possibility of electrifying the tion of its main line from Thunder Bay t Winnipeg. Power supplies would be a



A 5,000-horsepower electric locomotive is used to pull the 100-mile-an-hour Inter City Express over British Rail's 400-mile London-to-Glasgow line. The 58-foot locomotive weighs 80 tons and features four fully suspended traction motors.

roblem here because Ontario Hydro's ansmission facilities between Dryden and e Lakehead are nowhere near the rail-ay.

Mr. Service says one of the problems in upplying service to electric trains is that ey impose a large single-phase load on a ree-phase system. Without special con-deration this could create voltage imba-nces and possibly some communications roblems on certain low inertia parts of the stem. Over the major part of Ontario ydro's system, particularly in Southern ntario, such special considerations would ot be necessary.

He says in the event of electrification of e Toronto-to-Montreal line, supply points ould be spaced about every 25 miles with 25-kV system. Should the railways opt for 50-kV system, the distance between sup-y stations could be extended.

Although Canada uses one-quarter of s energy resources moving goods and eople, there has been a continuing drop transportation efficiency. Speed and exibility have become increasingly impor-nt — and increasingly energy-intensive.

Take, for example, the movement of freight. By rail, 670 British Thermal Units are used to move one ton one mile. An air-plane uses 42,000 BTUs for the same job, yet the air freight business is growing 15 per cent a year. Freight movement by truck requires four times as much energy as by rail, but until very recently truck tonnage has been growing at an ever increasing rate.

All this is happening in the wake of an energy crisis and at a time when utilities of all types are stressing the wise and efficient use of energy.

Perhaps that's the reason the newly-formed railway advisory committee established by the Railway Association of Canada and the federal Transportation Development Agency has suggested that railways take another look at electrification.

R.G. Maughan, chairman of the committee and a veteran of 30 years' railway engineering and operations experience, says electric trains, double tracking of main line routes and improved winter performance of trains are immediate operating issues facing Canadian railways if they're to meet future demands.

In co-operation with the railways, the committee will decide what approaches to take and recommend how resources are to be used, its chairman says.

"This is a complete railway effort," he adds, "and what it means is that for once we will all sit at the same table and decide collectively where limited resources can best be put from an industry view — and not from that of a company balance sheet." □

Heavenly power

Sunshine may mean dawn of a new day for energy

by Geoff White

Instead of looking around our environment or digging down into the earth for sources of energy, many scientists are looking up at a massive potential power producer: the sun.

Ever since man came into being, he has held the sun in awe and wonder, often as a god, and the principal one, at that. Even today, some primitive tribes still worship the centre of our planetary system.

Perhaps this was in the mind of several hundred scientists from 34 countries when they gathered in Paris under the auspices of the United Nations Educational, Scientific and Cultural Organization (UNESCO) to examine the sun's potential as a solution to future energy problems.

In theory, sunlight is an ideal answer to these problems — it costs nothing, it's pollution-free, and although its "generator" is about 93 million miles away there are no transmission costs, no rights-of-way problems, no breakdowns and no maintenance costs.

Still, it's theory.

Man has used solar energy to a limited extent. U.S. and Soviet moon-buggies, powered by the sun, have lurched around the lunar surface on exploratory missions, and space capsules have orbited on sun-generated energy. However, above the earth's atmosphere, power from the sun is more easily collected, which has helped prompt these developments.

One reason for the lag in developing solar power advanced at the Paris UNESCO talks was that it was comparatively cheap to extract fossil fuels from the ground.

Wealthy countries apparently are satisfied to continue this practice until their sources are exhausted and, conversely, underdeveloped nations don't have the money or skills to do solar research.

The scientists at the Paris conference urged that future developments should be based on international co-operation and not nationalistic rivalries so that duplication of research can be avoided, and time and money saved.

Investment in such research is surgi
For example, U.S. spending rose from $
million in 1972 to $3.8 million last year.
is budgeted at $13 million this year.

And it is expected that over the next
years, the research program will cost th
U.S. no less than $3 billion.

If, or maybe the word should be "when", solar power is available in a fo
capable of running machinery, its uses
could radically alter our everyday lives
with sun-run cars and other vehicles,
power from rooftop generators on hous
and other buildings, pollution-free urba
and rural areas and invisible transmissi
lines.

But when is "when"?

No indication of any major technolo
cal breakthrough was given in the 400
papers presented at the Paris conferen

But the conference, not comprised o
fanciful dreamers but practical, intellig
scientists, held a note of hope in its offi
title: The Sun in the Service of Mankind

One sunny day, there will be solar p

Paring the budget

Seminars help industries save on energy costs

by Bill Settatree

Rexnord's Doug Campbell



Doug Campbell is an energy czar.

He's actually the factory manager for Rexnord (Canada) Ltd., a Toronto manufacturer of environmental protection equipment. But last year he was given the unofficial title of energy czar for Canadian operations as part of a conservation effort prompted by the 1973 energy crisis.

His goal at the company's North York factory is to reduce energy consumption by up to 25 per cent. The bulk of the savings would be in heating costs through conserving natural gas and other fuels, but the company hopes its electricity use can be cut by a minimum of 10 per cent.

The program includes periodic audits of energy uses, establishment of a simple measuring system to keep track of progress in meeting load reduction goals and keeping employees informed and involved.

A memo from the company's U.S. head office said, in part: "One big plus from the energy reviews can be to examine our wasteful practices and actually cut our operating expenses or at least hold them as energy costs go up."

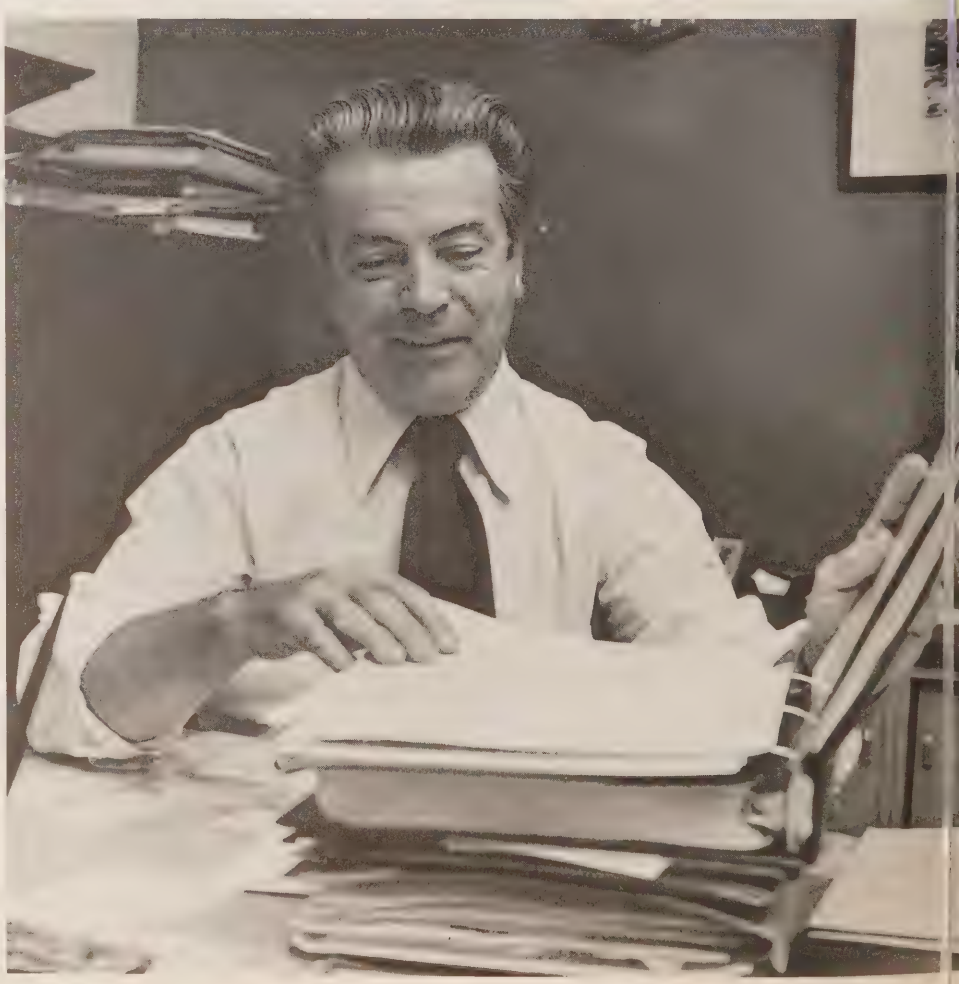
A number of manufacturers are taking similar steps and are being encouraged by Ontario Hydro through energy management seminars and visits to manufacturers by staff industrial consultants.

Since Ontario accounts for more than half the manufacturing in Canada, these conservation measures may well have a significant effect here on gas and oil companies, Ontario Hydro and the municipal utilities.

In fact, industrial and commercial use of electricity in the province during 1973 totalled 79.5 billion kilowatt-hours, about 62 per cent of the total electricity consumed that year.

Roy Durham, a Hydro industrial specialist, feels that wise energy management in the industrial and commercial sector can have a positive effect on Hydro's load situation. He feels that through seminars and factory visits by Hydro engineers, industrialists will become more aware of the advantages to be gained through better use of energy sources. "They must be prepared to spend some money, but it will be money well spent."





"It is not our purpose to urge unrestrained expansion in the use of electricity," he said. "We seek only to develop use of electricity in a rational way to derive the maximum economic and social benefit from the facilities required to sustain and increase Ontario's prosperity. However, it makes good sense that, although we are not short of electricity, we should not waste it."

Mr. Durham notes that in the past, electricity was a premium form of energy and in order to be competitive Hydro had to promote better insulation standards, room-by-room control and better and more accurate temperature controls for process heating.

The energy conservation seminars discussed rate policies and price trends, power factor improvements in industrial plants, electric load scheduling, the use of off-peak power in industrial plants, insulation, efficient lighting and waste heat reclamation.

Many of the areas covered in the one-day meetings had already been dealt with in Rexnord's own program.

As he talked about the task facing him, Rexnord's energy czar sat in his shirtsleeves in a windowless office in the company's North York factory. He lit a cigarette and then puffed away. As the smoke filled the air he mechanically reached for a wall switch and turned on an exhaust fan. A few moments later he butted the cigarette and, almost as mechanically, turned off the fan.

"You know," he said, "we've always strived to improve our cost position and have been trying to conserve energy for years. For instance, in the past two years we've been working to replace incandescent lighting with mercury vapor. It's more efficient and less costly to operate. Since the energy crisis this program has been hastened."

The company converted its two water-cooled air conditioning units to save energy. One was changed to a recirculating unit with a cooling tower to do away with water wastage while the other has been changed into an air-cooled system. The plant's boilers have been changed from oil to natural gas.

"One thing we did that we had not

lexnord's energy czar Doug Campbell pulls witch to shut down a huge compressor which n't needed by the evening shift. At left, Honey-ell's Bev Markle and Hydro industrial energy onsultant Ed Kulperger examine the results of 13-day load test. Below, Mr. Markle inspects s growing energy conservation file.



thought of previously was to install a small compressor for use by our night staff rather than using the big daytime unit inefficiently with fewer staff in the off-peak periods," said Mr. Campbell.

Another manufacturing company that has placed emphasis on controlling its energy use is Warner-Lambert Canada Limited with seven plants throughout Ontario. The company makes a wide selection of products from antacids and shampoos to razors, mouthwash and pharmaceutical products.

Harry Miller is the plant service superintendent at the company's Canadian head office in Scarborough. He, too, is responsible for energy conservation.

"Our company has a cost-improvement program and I head up one of the teams for this plant. Energy is the prime cost consideration. We're budgeting $95,000 for electricity alone in 1975 at this location with $55,000 for other fuels."

He thinks that with good planning and a lot of conscientious work by everybody in his plant, the electric energy costs can be reduced by up to $10,000 a year or roughly 10 per cent. If similar reductions are achieved at other Warner-Lambert locations in Ontario, the company's energy conservation program will be well worthwhile. Its total Hydro bill is $354,000 a year.

After one of the energy conservation seminars, Mr. Miller asked Hydro's industrial consulting engineers to conduct a survey of his plant to determine steps that could be taken to reduce costs.

One proposal called for the reclamation of heat from the company's Bromo Seltzer drying unit. Another was for the installation of a chilled water storage unit that would utilize off-peak power. It would use water during the day for air conditioning, chilling and storing it at night, then reuse it the next day. Considerable savings are possible with such methods.

Ed Kulperger, Hydro's industrial energy consultant in Central Region, says the heat reclamation from the Bromo dryer was not considered economical by the company at the present time. "However, should price relativities of the various fuel alternatives

change drastically, and there is every reason to believe this will happen, waste heat reclamation from the Bromo dryer may become economically viable."

Energy management has literally been given a cool reception at other Warner-Lambert factories. Thermostats have been turned back and all lights, except night lights in non-operating areas, have been turned off when not in use. Equipment shutdowns have also been ordered, including some air conditioning units during non-business hours and weekends.

At its Bertrand Street plant in Scarborough, the manufacturing location for Adams Brands, Warner-Lambert estimated savings of 300 to 600 gallons of boiler fuel per week.

Mr. Miller has asked Scarborough Utilities to run a check on his plant's load fluctuations to determine whether costly peaks can be eliminated, thereby reducing the monthly bill.

Alwyn Lawrence, Scarborough Utilities consumer service engineer, said that if testing showed peaks and valleys could be levelled off by periodic equipment shutdown, Warner-Lambert would probably install a maximum demand meter alarm to control its own power flow. (With such a system an alarm would sound if load reached a predetermined peak.)

The Scarborough utility has recently gone to computer billing for its industrial customers, providing them with additional information that should help to determine whether savings can be achieved, Mr. Lawrence says.

"We are providing them with such information as their billed demand, load factor and power factor. If their power factor is less than 90 per cent, then they are paying a penalty. Many of them have contacted us with an eye to making economies."

One such firm was Burndy Canada Ltd. Plant superintendent Don MacKeracher asked Scarborough PUC to install a load demand meter on a test basis to determine whether the installation of a load demand controller would be justified. In another area, Burndy has installed capacitors to correct power factor and reduce electricity requirements. Such capacitors have paid for themselves in short order in other companies through reduced electrical consumption.

Mr. MacKeracher said, too, that consideration is being given to the installation of a heat recovery system from the foundry and the use of that heat somewhere in the plant to reduce other forms of energy. More emphasis is also being placed on turning off lighting when not in use.

Honeywell Limited has also asked Scarborough PUC to run tests on their load demand. Spokesman Bev Markle says the 13-day test results will help him to work out better utilization of his electrical load. "I would like to be able to reduce our billed demand by about 150 kilowatts," he said. "That would reduce our demand bill by $150 a month plus savings on energy consumed."

Honeywell's electrical bill runs about $120,000 a year and Mr. Markle hopes it can be cut by up to 10 per cent. He says 60 per cent of this bill is for lighting.

One of the possibilities being looked at is the length of time the 500,000-square-foot factory is in use. "We have people coming in here very early in the morning before business hours because they have a chance for a ride or for some other reason and I think we're wasting a lot of electricity. We've decided to control lighting and heat. When people come in early they'll have to go to one location and wait, say in the cafeteria, until normal business hours."

The question of weekend and overtime work is also under study. Mr. Markle feels that when such activities involve only a few people at a time an unnecessary strain is placed on energy systems.

"In our U.S. plants they've adopted a program where office people coming in under such conditions must be issued a desk lamp by a security guard because lighting throughout the plant is locked off in non-business hours. I don't think we'll be going quite that far here."

Mr. Markle is also looking at the installation of closed cycle water cooling equipment so that water used in cooling processes in the factory is not wasted bu used for heat for the building and for oth systems.

He explained that Honeywell's top ma agement is taking the energy crisis seri- ously and is expecting to spend money c it.

"In our U.S. operations we saved abo 22 per cent last year using 1972 as a bas

During last December alone, at the height of the fuel scare, Honeywell offici estimated that the company program across the U.S. had resulted in electrical load reductions sufficient to serve 7,200 homes for a month and enough natural g and fuel oil to heat 1,600 homes for the same period. Over a year they calculate they would conserve 72 million cubic fe of natural gas (enough to heat 900 avera homes for a year), 500,000 gallons of fue oil (also enough to heat 900 homes) and million kilowatt-hours of electricity (suffi- cient power for 6,200 homes for a year).

One of Mr. Markle's planned projects the installation of a computerized securi system that would enable him to control building heating, lighting and access fro one central location.

"We have to reach a happy medium f heat and light," he said. "But when you' a company that produces thermostats there are too many ways for people to adjust your own heat levels. One central control system would save us a lot in thi area."

Honeywell is very concerned about energy and ways to manage it. After attending the Hydro conservation semir Mr. Markle flew to the U.S. where he pa ipated in a similar venture sponsored by company for U.S. industry.

"The energy crisis isn't just a passin fancy. It's here to stay and industry has adjust to it. At Honeywell, we're trying t about three steps ahead in planning an half step ahead in action. It's pretty har though to dim your lights and turn dow your thermostats when stores, offices a supermarkets all around you aren't doi the same. We hope that we can provide some leadership." □





Alwyn Lawrence, consumer service engineer for Scarborough PUC and Harry Miller, plant superintendent for Warner-Lambert, inspect metering equipment installed to test the company's load fluctuations. Below, Mr. Miller examines dryer which Hydro consultants feel could produce sufficient waste heat for reclamation in other areas of the factory.

Continued from page one.

A 1937 graduate of the University of Toronto in political science and economics, Mr. Sissons spent the following year in Europe as a hockey-playing student, and later served as secretary of Hart House.

During the Second World War, Mr. Sissons joined the federal department of munitions and supply, serving in Washington and Ottawa from 1941 until 1948. He was awarded an MBE for his work.

Mr. Sissons joined Ontario Hydro in 1948 as executive assistant to the general manager and was named an assistant general manager 11 years later. He was loaned to the federal department of defence production where he organized and coordinated material priorities.

Mr. Sissons serves on the board of regents, Victoria University, is a director of the Canadian Club of Toronto, past president of the Canadian Association for Adult Education and a member of the board of the Ontario Science Centre.

Milan M. Nastich, 48, was appointed Hydro's assistant general manager — finance, in February, 1972.

During his Hydro career, which began in 1949, Mr. Nastich has served as a planning engineer in the system planning division: methods analyst; supervising methods analyst; manager, systems department; manager, budget and financial reporting department; comptroller; director of computing services; deputy director and director of the property division.

Born and raised in Vancouver, Mr. Nastich graduated from the University of British Columbia with a BA in 1947 and earned a BASc. a year later.

Chief engineer since 1965, Harold A. Smith, 55, joined Ontario Hydro in 1939 and obtained a BSc. degree from Queen's University in 1940.

As chief engineer he was responsible for Hydro's engineering branch, including operations, research, system planning, design and construction functions.

Born at Lucknow, Mr. Smith received his early education at Tara and Dutton. His first association with Hydro was in the system planning section. From 1943 until 1945, he served with distinction in radar development work with the Royal Canadian Navy for which he was awarded the MBE.

Mr. Smith has held a number of highly-responsible engineering positions at Hydro, including assistant to the director of engineering, frequency standardization engineer, co-ordinator, nuclear power group and director of the nuclear power projects department.

Mr. Smith was appointed assistant general manager — engineering in 1957. From February, 1958, to December 1961, he acted as manager, nuclear power plant division of AECL.

He is a Fellow of the Institute of Electrical and Electronics Engineers, a Fellow of the Royal Society of Canada, and in 1966 was presented with the Engineering Medal by the Association of Professional Engineers of Ontario. Earlier this year he was awarded the W.B. Lewis Medal for his contributions to the nuclear industry.

George Currie, 58, has been Hydro's Western region manager since 1969. He joined Hydro in 1939 and held several consumer service positions both in the field and head office before being appointed director of consumer service in 1968.

W. Dennis Gillman, 55, has been executive director — computers since 1967. A chartered accountant, he joined Hydro in 1957 as manager of budgets and statistics and two years later became executive assistant to the assistant general manager and comptroller. Mr. Gillman was named director of accounting in 1960, comptroller in 1961 and executive director — finance in 1964.

Frank W. Gomer, 52, has been Hydro's comptroller since 1970. He joined Hydro in 1949 as municipal accountant and later became cost accountant in the Toronto region. He was appointed regional accountant in Niagara region in 1958, power costing officer in head office in 1964 and held various other positions in the financial branch.

Gordon M. McHenry, 57, has been director of labor relations since 1969. He began his Hydro career in 1948 in the system planning division and two years later became area planning engineer, frequency standardization division. He was consumer service engineer in Western region from 1953 to 1959, manager of residential sales from 1959 to 1964, and then served as manager of Western region.

Wendell C. Cunningham, 55, was appointed earlier in 1974 to a newly-established position, director of fuels and supply resources development, after having served as director of supply since 1958. Mr. Cunningham joined Hydro in 1937 and held various positions in the purchasing department until 1955 when he was loaned to the organization services division. When he returned to the supply division in 1956, he served as administrative assistant to the director and assistant director before becoming director.

Pat G. Campbell, 53, has been assistant chief engineer — design and construction since 1965. He joined Hydro in 1947 as engineer on the Manitou Falls project and has since become associated with a number of construction projects, becoming director of construction in 1957.

Lorne G. McConnell, 50, has been director of the thermal generating division since 1970. He joined Hydro in 1955 as reactor liaison engineer — NPD design having previously worked with the National Research Council and AECL. He was appointed station superintendent at NPD in 1960 and between 1963 and 1970 was nuclear operations engineer. □

OMEA focuses on rates, restructuring problems

Hay Blasts OEB ruling but could spell trouble for utilities

An Ontario Energy Board proposal to reduce Ontario Hydro's reserve capacity margin by at least 5 per cent may get municipal utilities into trouble in meeting future demands of their customers, says Dr. R. H. Hay.

As the OMEA's representative at the Ontario Energy Board hearings, Dr. Hay told the fall round of OMEA meetings that there he felt the board "fell down was in paying more attention to some of the other intervenors than to the OMEA, and recommending that Hydro's planned reserve generating capacity could be substantially reduced."

The key points of phase one of the hearings, Dr. Hay says, were system reserve and system reliability. He adds that Hydro's load forecasters cannot base their forecasts on what the energy board, government, Pollution Probe or the Sierra Club thinks.

"Load forecasting must be based on the best estimate the forecasters can come up with. Any threat to natural gas or oil supplies for home heating is going to mean an increase in the use of electric energy in that area and the reserve capacity should be available to meet increased demands," Dr. Hay said.

He expected to see electrification of mainline railways between Toronto and Montreal in the not-too-distant future.

Dr. Hay said the OEB hearings were supposed to have been a review of Ontario Hydro's operations, "but they were carried on by a group steeped to the core in regulation."

During the second phase of hearings which dealt with financial policy, Dr. Hay said the OMEA was critical of Ontario Hydro's proposals on several scores and "the language of our brief may have been a little too colorful in some places."

And he was highly critical of both board counsel Robert Macaulay and Hydro counsel Pierre Genest. He described Mr. Macaulay as "one of the foremost men in the legal profession — but an actor. He makes the most of a situation — dramatizes.

"I certainly was surprised at the way in which the OMEA position was attacked not only by Hydro's counsel but by the board counsel, too. Our position was subjected to eight hours of cross-examination, but in a back-handed sort of way it was accepted by the board," Dr. Hay said.

He added that the consumers of electric energy in the province were represented only by the OMEA and the association has a responsibility to protect its customers from unnecessary high rates for electrical service. "We represent more than 2 million ultimate customers," he said.

Dr. Hay said he was "extremely unhappy with Mr. Macaulay on the matter of putting OMEA questions before the board. Mr. Macaulay wanted our questions in writing and we prepared a list of questions for him to ask on our behalf — but it was an exercise in futility and in the end we gave up and hired our own counsel."

Only in the third phase, Dr. Hay said, was there adequate press representation at the hearings, "and even then I saw a reporter sound asleep."

He cautioned that the Association of Direct Customers of Ontario Hydro is "no friend of the OMEA. As a matter of fact I was reminded of the cartoon character Pogo as I sat in those hearings — I realized now we've seen the enemy," Dr. Hay said.

He said the direct industrial customers are in no way friendly toward the municipal co-operative and from ADCOH's point of view its membership would like to see the municipal utilities done away with and "act as nothing more than bill collectors for Ontario Hydro.

"However," he added, "Mr. Genest argued, successfully, that a decision of that nature was not the responsibility of the board."

Dr. Hay charged that an OMEA recommendation that Ontario Hydro collect a $30 million deficit — with interest — that has been allowed to accumulate in the power district was completely ignored.

He said the board felt it did not think Hydro would start to collect that amount in 1975 and he felt there was a complete misunderstanding of the evidence presented.

Dr. Hay said the board questioned how Ontario Hydro was to find out who was responsible for the deficit. "Everyone in the power district is responsible and the higher the charges to the direct industrial customers, the fairer are the allocations of power costing.

"Industrial customers get their energy for the least possible amount. We'd be better off if they were to pay less on demand and more for energy. They haven't paid enough for their energy, consequently they haven't paid their way.

"But," Dr. Hay said, "the municipalities have. They pay it every year on their thirteenth bill."

Inflation a thief – Gathercole

The fact that the Ontario Energy Board did not accept all of Ontario Hydro's submissions — any more than it accepted all of the submissions of the Ontario Municipal Electric Association — is a great tribute to the effectiveness of the board, Hydro chairman George Gathercole told delegates to the District 2 annual meeting.

Mr. Gathercole pointed out the board was dealing with highly complex issues and neither Hydro nor the OMEA could expect it to accept everything both organizations submitted.

But he emphasized that he did not agree with all of the OEB proposals, particularly the recommendation that a proposed 15.3 per cent rate increase not be accepted.

"I'm not in favor of high rates. I'm in favor of the lowest possible rates, but Ontario Hydro needs money to combat inflation," Mr. Gathercole said.

"Inflation," he added, "is an insidious, dangerous disease. It robs people of their savings, their investments and their pensions. It is not only grievously inequitable and unjust, but it also has grave economic consequences. It leads to a misuse of human and material resources. It stimu-

lates unnecessary accumulation and hoarding. People's energies become absorbed in gaining a speculative profit or protecting themselves from erosion in their purchasing power.

"Much of the burden falls upon the unprotected — among them old people who, having contributed much to society, now see their savings slipping away.

"I recognize that some look upon inflation as an elixir that oils the economic machine and maintains full employment," Mr. Gathercole said.

But, he added, "this is a myth. You cannot get a quart of wine out of a pint bottle – and that is what we have been trying to do. There is no incompatibility between a stable price level and high employment. From 1952 to about 1961, the consumer price index in Canada rose by only about 1 per cent a year, yet that was a period of balanced growth, high levels of employment and prosperity.

"I concede it is not possible to wholly insulate Canada from inflation when it is so rampant in other countries. But a variety of nations have demonstrated that by exercising more discipline the rate of inflation can be contained.

"What level of inflation do we think might be beneficial? If 4 to 5 per cent inflation is all right — we used to think it was horrendous — what is wrong with the 10 or 11 per cent that we now have, or 20 or 30 per cent?

"It is suggested that we can protect members of society by indexing salaries, wages, pensions, interest rates and so on. Under rapid inflation, considerations of equity demand that adjustments of this kind be made, but they are nothing but a palliative — the adjustments never catch up. The danger is that we come to rely upon indexing instead of exercising a measure of restraint and discipline," Mr. Gathercole said.

He said he knew that other countries throughout the world, particularly in Latin America, have been surviving with lively inflation for many years. "What is overlooked is that many, if not all, of them are dictatorships. Sustained inflation can undermine the democratic roots of our society."

Mr. Gathercole pointed out he has spoken out against the pitfalls of inflation for years because it has serious implications for Ontario Hydro and all highly capital-intensive industry.

"For many years," he said, "Hydro was able to hold the rate line despite rising prices, interest rates and wage costs. We had a large investment in physical plants which tended to dilute the effects of these earlier cost increases. But as new plants have been brought into operation they have carried higher interest rates, prices and construction wages which have to be passed on to the customer. Rate increases have had to catch up.

"This," he said, "is a process that is likely to continue long into the future. If wages and prices were frozen today, Ontario Hydro would still require increases in rates in the years ahead — or go bankrupt."

Mr. Gathercole said that being capital-intensive, Hydro requires long-term investment. Hydro starts projects now that will not be operating for another 10 years and many of the facilities have an economic life of more than 30 years. "We therefore prefer to finance most of the cost of these facilities long-term. Inflation militates against this. Interest rates have to be increased to provide the inducement to investors to commit their funds. In addition, because of the rise in construction costs, we have to spend more and borrow more.

"There is no simple answer to turning off inflation, but we must work to abate it. This can be done only by the collaboration of all segments of society," he said.

Mr. Gathercole, who retires as Ontario Hydro chairman on December 31, said he believed in progress, in economic growth, and he believed that most people want it. "Needs and values changed radically in the '50s, '60s, and early '70s, but I also know that a substantial segment of our population — despite prodigious efforts by governments in social programs — still remains on the outside looking in on our so-called affluent society."

In a farewell message before steppir down as chairman, Mr. Gathercole urge that the municipal partners in the Hydrc enterprise must remain strong. "Chang inevitable, but the fundamental role of t municipalities should be preserved," he said.

System growth probe may last two years

Ontario Hydro's long-range planning of provincial power system up to 1993 will the subject of its next major hearing, expected to last two years or more, pre dent D. J. Gordon told delegates to the trict 2 annual meeting.

Although the hearings are expected be lengthy, Mr. Gordon said the specifi mechanism — whether the Ontario Ene Board, the proposed Environmental Review Board, or an independent comr sion — has yet to be decided by the go ernment.

Mr. Gordon added the system expansion program will be subject to ir sive public scrutiny.

He added Hydro's long-range syster planning report deals in concepts, not dictions, and that was an important dist tion. "A concept," Mr. Gordon said, "is defined as an idea or design conceivec advance of giving it expression or form

"A long-range plan developed by an electric utility is different from a long-ra plan for land use or regional developm issued by government. The governmer plan is a statement of intent, with the in cation that it will be backed up by legisl tion which will ensure that it comes to fruition.

"A utility plan, on the other hand, is a statement of what might happen in th future if certain other things, over whic the utility has no control, come to pass The utility plan can only say that if the l growth is in a certain range, and if cert technological and social changes take place, it is most likely that a future pow supply system of the type shown in the will be adequate for the supply of elect power in the area," Mr. Gordon said.



Among the men who will lead District 2 for the coming year are, back row: Oscar Finnson, Gravenhurst; Ross Densmore, Arthur; James Church, Bradford; Gordon Tudhope, Parry Sound; C.M. Watt, Barrie, and Robert Gardhouse, Port Elgin. Seated: W.G. Boyes, Alliston, past president; H.J. Cameron, Kincardine, president; C.J. Larsen, Walkerton, first vice-president, and H.J. Murphy, Barrie, secretary-treasurer.

"Planning has been defined as what you
o so that in the future you will be approxi-
ately right instead of exactly wrong," he
aid.

Mr. Gordon explained the long-range
stem plan provides an over-view for
ydro and others to carry out short-term
anning. For Hydro, this is 10-year solid
ommitment planning.

He added: "As long as the tentative
ature of long-range planning is recog-
zed, it can be of value to government,
tion groups, and the public in providing
em with a context or framework within
hich to evaluate the utility's short-range
ans.

"Secondly, it offers an opportunity for
overnment and the public to see the gen-
al direction Hydro must proceed in,
sed on the current social values, needs
d goals as we perceive them. If someone
ys we don't perceive them accurately, or
e really are blind to them altogether, then
is report (the long-range planning report)
ves them the opportunity to tell us so and
rrect our assumptions.

"For example," said Mr. Gordon, "if the
overnment decides that social and eco-
mic goals can be achieved by a 4 per
nt annual growth rate in power demand
d it is prepared to take whatever steps
e necessary to enforce that growth rate,
e. We will follow that guideline in our
pansion plans.

"But the point is, it is more productive to
scuss such things in a 20-year time
me, when options are open, than debate
mly-committed plans such as the expan-
on program to 1982 which has been reviewed by the Ontario Energy Board. In the short-term, alternatives are extremely limited.

"An analogy continually used at the energy board hearings was that the expansion program to 1982 was like a moving train and you could hardly stop it and begin laying new track to a different destination. To extend this simile to Hydro's long-range planning report, it is an opportunity to lay some track before the train pulls out of the station," Mr. Gordon said.

Dealing with the report per se, Mr. Gordon said obviously the key ingredient or assumption is the demand to be served, the rate of growth in the consumption of electricity by the people of Ontario.

"Let us be clear on that one — it isn't what we think people ought to use; it's what we think they might use and what we think they will demand that we provide to them.

"If judgments are to be made on the social or environmental desirability of comparative growth rates, they should be made by other than utility people," Mr. Gordon said.

Gear for change Bowker warns

Municipal utility commissions must prepare for public hearings into the restructuring of utilities, says OMEA president A.J. Bowker.

In talks to fall district meetings, the president told commissioners to get their logical and emotional arguments in order. "It is necessary to have statistics available. And, I suggest to you that these statistics should be developed by your own staff, the staff of the municipal commissions within your area."

Mr. Bowker, chairman of Gloucester Hydro, said the provincial government had accepted the provincial restructuring committee's report, released last March, with few modifications. The report had recommended restructuring of utilities into either upper or second-tier operations in the areas where regional government has been established.

Depending on the results of studies in each of these areas, there could be one utility for each region or an amalgamation of utilities to form operations at the lower tier or community level. A central co-ordinating committee is to be appointed to work out details of the studies for each area and the implementation of the changes.

Mr. Bowker announced that S.A. Baldwin, of Ancaster, would be the OMEA's representative on the soon-to-be appointed committee.

While urging utility commissioners to prepare for public hearings on restructuring, Mr. Bowker criticized the Ontario Energy Board hearings into Hydro's capital expansion program and proposed rate increases.

"Ontario Hydro is being burdened with a newly-created civil service bureaucracy", said the OMEA president. "They and we have been obligated to appear before these government-inspired hearings following government-prescribed procedures in circumstances chosen by the government, all at costs to be borne by Hydro — not only its own costs but those of the energy board as well."

Mr. Bowker claimed the hearings had cost millions of dollars. He said Hydro had been obligated to develop a special full-time department, known as the rate review department, to co-ordinate the corporation's submission to the energy board.

"On the other hand, the Ontario Energy Board has advertised for, and probably obtained, several engineers and chartered accountants to serve the board in its review with respect to Ontario Hydro rates

and programs. The energy board has rented 12,000 square feet of floor space for its offices. It has required space for hearings, support staff, solicitors, transcription services, and other supporting groups, and there is an obvious escalation of costs."

The result of all this on the OMEA was increased activity, additional expense and attacks on the association's credibility, said Mr. Bowker. "In addition, we have been led through a maze of time-wasting procedures, changed appointments, times and dates of representation, lead times, various schedules for the hearings, and all the while never seeing the development of openly-arrived-at, decision-making processes. The board makes many decisions behind closed doors, making a mockery of the suggestion that the hearings would open up the decision-making processes for public scrutiny.

"We have been given a lot of eyewash about a rate review versus regulation, yet the hearings have developed into confrontations typical of rate regulation boards. It is interesting that this type of process is not used for operations such as road locations, hospitals, schools, etc., that the government departments handle."

Get on with job Bradley urges group

Immediate action on the restructuring of municipal utilities to clear up uncertainties was urged by AMEU president Ivan Bradley at the annual fall meetings of the OMEA districts.

The AMEU represents utility managers and senior staff while the OMEA is made up of the elected commissioners.

"We utility managers have felt the winds of change for a number of years," said Mr. Bradley, "and I would personally urge the newly-formed central co-ordinating committee to get on with the job so that thousands of utility and Ontario Hydro personnel will know in which direction they are headed."

Mr. Bradley is manager of Waterloo Hydro, a utility which could be affected under regionalization.

"Decisions regarding restructuring must be made, keeping in mind the economics of operation in new utilities, and equally important, these decisions must be fair and equitable to thousands of career employees who will be affected."

Mr. Bradley announced that the AMEU's representative on the central co-ordinating committee will be Gordon Stacey, general manager of Guelph Hydro.

Referring to the long-established training schools for linemen, Mr. Bradley said the government has decided to establish a non-regulated lineman training course because electrical contractors are doing more utility work. "However since Ontario Hydro and municipal utilities employ more than 90 per cent of the linemen in Ontario, it is only natural that we must continue controlling the syllabus and curriculum at Orangeville."

Mr. Bradley said both Hydro and the OMEA agreed with this philosophy.

"If contractors are to be trained under government subsidy, it must be in accordance with our syllabus and our methods. If not, the consequences could result in a lower standard of qualifications and safety than would be acceptable to us."

Mr. Bradley also outlined studies which had led to a proposal for a standard approach to underground servicing and charges in new subdivisions. While the formula was intended as a guide and was not mandatory, he urged each utility to study the document and attempt to use it in an effort to have each municipal utility treat subdividers in an equal manner.

The AMEU president also touched on the problem of material shortages. "The supply and delivery of materials is becoming a nightmare. Transformers and other vital utility products are apparently in short supply and yet subdividers and builders continue on their merry way, often coming to the utility at the last minute for instant service."

Mr. Bradley suggested that the almost instant electrical service which the public took for granted could be jeopardized by a general economic slowdown and the running out of utility supplies.

"I feel the crunch is coming," he concluded.

Costs go up, up, up

Prices for standard utility stores items a escalating at a rate of anywhere betwee 15 to 150 per cent, says P.R. Stratton, Ontario Hydro's assistant director of su — services.

Mr. Stratton told OMEA District 2 del gates an estimated weighted average p increase on 1,700 items would be abou per cent.

Hydro's supply personnel have witnessed the unexpected buildup of inver ries to meet future demands which have not fully materialized as a result of the c struction slowdown, especially in the re dential sector, and the delayed start of proposed EHV lines with associated sta tions and projects.

"We have witnessed supply lead tim escalate from weeks to months — and few cases to a year or more. We have experienced unprecedented back orde ratios which in the aggregate have bee three times higher than preceding year and, for certain items requiring polyeth lene in their manufacture, there are pro spects for continuing shortages throug 1976."

Mr. Stratton pointed out supply peop are working with regional personnel to determine the extent of imbalances in a and central stores inventories and the impact of rescinding some, if not all, th priorities which were applied to new ins lations, maintenance and renewals of Hydro's distribution system during the few months.

He added that demand requisitions f Ontario Hydro regions for 1975 are bei updated to reflect the dramatic shift fro the booming economy of 1973 to the "stagflation" of 1974.

"Our immediate aim is to stabilize a atile supply-demand situation as quickl possible, but with the experience of the year vividly in our minds, our first conc will be to curb any tendency to overrea



Included in the new District 3 executive are front row: D. A. Bainbridge, Atikokan, first vice-president; E.G. Caccamo, Schreiber, president, and Frank England, Kenora, past president. Back row: R.V. Wilmot, Thunder Bay; Frank Capello, Thunder Bay, secretary-treasurer, and Don Michelin, Sioux Lookout.

"We're still faced with material short-
ges for certain items such as pad-
ounted transformers, underground cable,
nd poles, and we do not expect most
ems to be available on the basis of tradi-
onal lead times for some time to come.
"But there seems little doubt that the
aterial shortage crisis peaked for us in
une and what we are now facing is a more
anageable problem of isolated item
ortages and an imbalanced inventory,"
r. Stratton said.

More power eeded in north

ntario Hydro has no strong preference
r a generating station site in Northwest-
n Ontario, says K.N. Bodkin, regional
anager.

In his report to District 3 OMEA dele-
ates, Mr. Bodkin discussed the need for a
ew site to accommodate an 800-MW sta-
on fuelled by Saskatchewan lignite with
e eventual addition of a 2,000-MW
uclear plant.

The regional manager emphasized that
deficiency in generating capacity in the
orthwest has been overcome by power
urchases from Manitoba. Hydro's con-
act with Manitoba will be extended from
978 until 1982.

"Even with this extension we will not be
ble to defer installation of new generating
apacity."

Mr. Bodkin warned that anticipated
dustrial and resources expansion in the
ea could accelerate the annual growth
te in power demands.

Northerners ask ban on strikes

District 3 OMEA delegates want strikes banned in municipal utilities.

A resolution to this effect was endorsed by delegates in Kenora and will be submitted to the provincial OMEA convention in March.

The resolution describes electricity as an essential service and advocates compulsory arbitration as a means of resolving contract disputes.

The resolution was submitted by delegates from Thunder Bay Hydro.

Another Thunder Bay resolution criticized Ontario Hydro's proposed bulk power rate increases. It urges the Ontario Energy Board to carefully consider "the unprecedented hardships on municipal commissions that would result by allowing Ontario Hydro to implement this accelerated rate increase without submission of well understood and acceptable reasoning within time limits that would adequately allow the dissemination of these facts to the customers of the municipal commissions."

A third resolution, submitted by Kenora, asks Ontario Hydro to approve the implementation of a flat rate connection charge to be paid to each utility by new customers.

The resolution noted that there are similar charges for other services such as telephone, cable television, sewers and sidewalks and said it would help to reduce utility costs.

Pay adjustments granted by PUCs

Many utilities have been asked to re-open collective agreements with employees because of the escalating cost of living, says E.G. Reynolds, Ontario Hydro's manager of municipal labor relations.

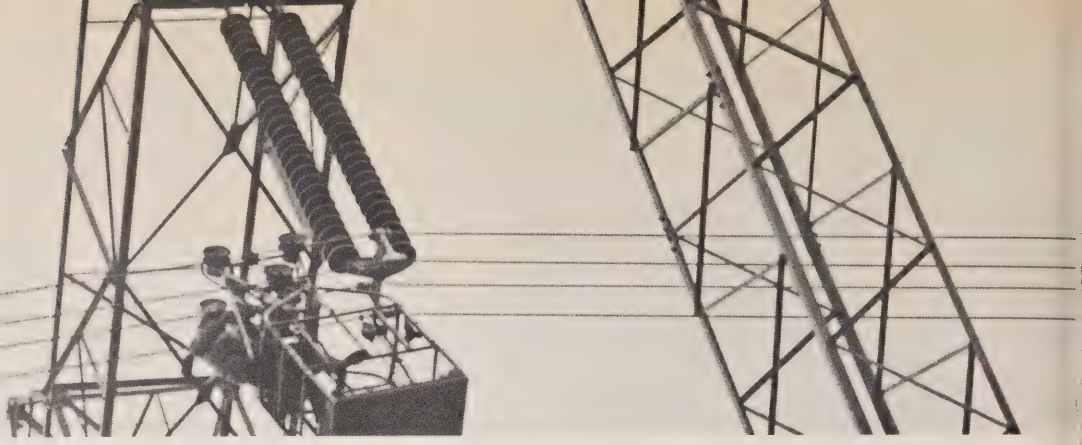
Speaking to District 3 OMEA delegates in Kenora, Mr. Reynolds noted that from January through August, 20 municipal utilities had granted wage adjustments over and above their general increase because of the escalation in the cost of living. The amount ranged from 1.5 to 6 per cent.

Only five municipal utilities have escalator clauses in their contracts, said Mr. Reynolds.

"The main problem with having a cost-of-living clause in your collective agreement is the fact that management does not get any credit for it at the bargaining table. Employees expect the going general increase at the time of renewal of the collective agreement on top of the increases granted by cost-of-living clauses."

He said unions had been appealing to utilities to re-open contracts and as a result of numerous inquiries, his office had drawn up a set of guidelines. He advised that if adjustments are considered, under no circumstances should the collective agreement be opened. "Don't negotiate with the union as to the amount. Decide as management what you will do and advise them in writing what action you propose." □

along hydro lines

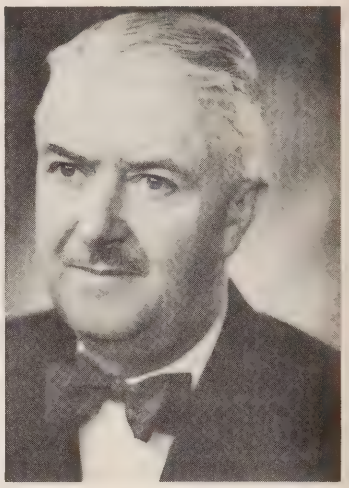




Donald B. Ireland



Omer S. Russell



Robert H. Hillery

Three retire from top posts

Chairman George Gathercole has paid tribute to three senior executives of Ontario Hydro who retired October 15, each with more than 45 years of service to the province.

The retirements of Donald B. Ireland, assistant general manager — regions and marketing; Omer S. Russell, assistant general manager — personnel and Robert H. Hillery, assistant chief engineer — operations coincided with the setting up of a corporate office and a new general management structure.

Mr. Gathercole said "the loss of their wisdom, integrity and vast fund of knowledge and experience will be felt throughout the organization."

Both Mr. Ireland and Mr. Russell joined Hydro in 1930 and have served with distinction in a variety of posts. Mr. Hillery's service stretched over approximately 50 years except for a short period when he returned to college.

Although he has officially retired, Mr. Hillery has been retained for a limited period to assist in overseas projects with which he has been closely identified. Under the program, started in 1961, Hydro personnel have been sent abroad to help developing nations to commission power plants and transmission facilities. Nations like Iran, Ghana, India, Pakistan and Nigeria have benefited from the program.

Mr. Hillery was born in England and received his early education there before coming to Canada. He attended secondary school in Hamilton and graduated in electrical engineering from the University of Toronto in 1931.

Before attending university he worked as an Ontario Hydro operator from 1924 to 1927 and in 1928 and 1929 worked summers in electrical maintenance. After graduation he started as a meter and relay engineer; became executive assistant to the assistant chief engineer in 1939; assistant superintendent, maintenance, in 1945; operations manager, Toronto region; administrative assistant, regions; and was appointed director of operations in 1957. He was named assistant chief engineer — operations in 1970.

Donald B. Ireland was born in Strathroy and attended public and high schools in the Strathroy district. He received his engineering degree from the University of Toronto.

On July 10, 1930, he joined Hydro and worked his way up from laborer to assistant general manager — regions, a posit to which he was appointed in 1970. Alor the way he served as a lineman, superin tendent, area manager, consumer servi superintendent, assistant municipal ser ice engineer, consumer service enginee director of consumer service and execu tive manager — regions.

Mr. Ireland is a member of the Toront Electric Club, the Association of Profes- sional Engineers of Ontario, the Canadi Club and the Board of Trade.

Mr. Russell was appointed assistant general manager — personnel in May, 1968. He was formerly executive manag regions.

He was born in Delta, Ontario, and received his early education there and i Brockville. He is an engineering graduat from Queen's University.

Before joining Hydro on a permanent basis in 1930, Mr. Russell was a student employee for two summers. He started c as a junior engineer and worked his way through the ranks to line supervisor, ope tions engineer, regional manager, direc of management services, executive mar ager — regions and finally assistant ger eral manager.

He's a member of the Association of Professional Engineers of Ontario, the Canadian Club of Toronto, past preside

the Electric Club of Toronto and the ntario Hydro Quarter Century Club, a ember of the Toronto Board of Trade and le Personnel Association of Toronto.

ates rise

Ontario Hydro has announced rate ncreases for electricity in 1975 closely in ne with recommendations made by the Ontario Energy Board following extensive blic hearings.

Effective January 1, the average wholesale rate to municipal utility systems will go by 12.4 per cent. Rates to customers of Hydro's rural system will be increased 11.4 per cent and large industrial customers served directly by Hydro will pay an average of 15.2 per cent more.

In a letter to Darcy McKeough, Ontario Minister of Energy, Chairman George Gathercole said that Hydro's board of directors had accepted in principle the OEB recommendations on the key factors affecting 1975 rates with one significant exception — the recovery of deficits from the direct industrial and rural systems.

In April, Hydro proposed an increase of 13 per cent in wholesale rates to municipal utilities and a 16 per cent increase to direct industrial customers. In its report to the Minister of Energy in September following a public review of the Hydro submission, the OEB proposed a rate of 12.7 per cent for municipal utilities and 14.5 to the direct industrials.

The decision to recover deficits is the reason the industrial rate is slightly higher (17 per cent) than proposed by the OEB. The 12.4 per cent increase in wholesale rates is a precise calculation of the effects of the OEB's recommendations.

The increases for 1975 represent a increase in revenue to Hydro of approximately $22 million, compared with the original rate proposal.

"In accepting generally the OEB recommendations on rates," the letter said, "the Hydro board does so with some concern because they will result in heavier borrowings at a time when interest rates are rising."

Among the OEB proposals accepted by Hydro were a lower rate of return on equity, an increase in charges for energy consumption and postponement until 1976 of a three-year "smoothing" of rate increases.

Hydro's original rate proposals would have provided a return on equity of 10.5 per cent. Instead, it will accept about 9.25 per cent and a resulting shortfall in revenue, based on an OEB formula allowing Hydro two percentage points above the average cost of long-term debt.

The Hydro board accepted the OEB's suggested charge of 4.5 mills per kilowatt-hour as the energy rate for bulk power customers and 5 mills for directly-served industrial customers. The board said the OEB recommendation results in a shift in the cost of power from municipal and rural customers to direct industrial customers of an estimated $1.5 million more than Hydro's original proposal.

The major departure from the OEB's recommendations is the recovery of deficits from rural and direct industrial customers. Noting that a cardinal principle of Hydro's financial policy is that there be no cross-subsidization among customer categories, the Hydro board said it "is convinced that it should make a start on recovering the deficits in 1975 so that equity is maintained between the municipal, rural and direct industrial systems."

The Hydro board supported the view of the municipal utilities in adhering to the procedure approved by majority vote at OMEA meetings on the phasing out of a return on municipal equity.

Although rural retail rates were outside the scope of the OEB's deliberations, Ontario Hydro has factored in the effect of the OEB proposals in arriving at the 11.4 per cent increase for rural customers.

The Hydro board said full attention would be given to the OEB's opinion that greater reliance should be placed on fossil fuel stations compared with nuclear and that it would review "as a matter of urgency" projections of supply and demand for heavy water.

Priority will also be given to a review of the OEB's suggestion that planned power reserves be reduced by five per cent. The Hydro board said eight studies have been authorized in areas on which the OEB commented and that an analysis of other suggestions and comments contained in the OEB report will be carried out as quickly as possible.

Studies authorized by the board include: Hydro's productivity in comparison with other utilities; new means of allocating costs among Hydro's customer classes and the impact of proposed increases on power demands; methods of allocating radial transmission and specific facility charges; power export policy; the impact of different service levels and standards; an over-all study of depreciation policies and practices; energy rates, and charges for industrial customers who buy power on an interruptible basis.

"The Hydro board recognizes that rate increases of any size are most regrettable", said the letter. "At the same time, Hydro has been faced with an unprecedented rise in interest rates, wages and salaries, fuel costs, and the cost of all goods and services. If Ontario Hydro is to remain financially strong and capable of meeting the future power needs of the people of Ontario, then these proposed increases in the cost of electricity are absolutely essential."

Ed Washburn remembered

Ed Washburn's memory will live on in Burlington.

Civic officials, members of his family, a host of dignitaries, and a group of neighborhood children stood in reverent silence recently while the widow of Burlington PUC's first general manager unveiled a bronze plaque mounted on a huge boulder, renaming a memorial park and reservoir in Mr. Washburn's honor.

Originally called the Heathfield Reservoir, the three-million gallon reservoir is located on a site purchased in the late 1960's. The $725,000 structure was completed in August, 1974 and landscaped to form a park.



Memorial plaque

Mr. Washburn was involved in the initial planning and the Burlington commission by resolution renamed the project the E.A. Washburn Memorial Park Reservoir in memory of its first general manager and secretary.

Mr. Washburn was named to the position when the utility was created in 1958 through the amalgamation of the local Hydro commission and the municipality's Water Inter-Urban Board.

More tender information

Public opening of tenders and disclosure of the amount of each bid is part of a recently-revised purchasing policy adopted by Ontario Hydro.

Objective of the new policy is to provide as much information as practicable to the public, says Hydro's director of supply, Harold Kennedy.

Public opening and price announcement will be for tenders on construction and services projects estimated to cost more than $50,000. All bidders on contracts estimated to cost more than $10,000 will be informed of the final selections and the reason for the selection.

However, with purchases of materials and equipment in which quality may differ substantially, price alone may not be meaningful.

"We feel that a distinction must be made in the handling of construction and service contracts and those applying to materials and equipment," Mr. Kennedy says.

He adds that construction services are non-repetitive and usually present a straight-forward evaluation. "As a result, disclosure of prices would have no detrimental effect on the competitive environment.

"However," he added, "Hydro, by itself, represents a large market for materials and equipment. Disclosure of prices, particularly in the current short supply market, could cause upward leverage of prices. In some cases, uranium for instance, disclosure of prices would dissuade potential bidders."

The new policy is in line with Task Force Hydro recommendations.

municipal briefs

When the lights flickered in Meaford recently, it was a bit of a puzzle to the PUC. But an OPP constable solved the mystery for manager Roy Bishop and his staff when he reported that he'd seen a crane fly into an Ontario Hydro 44-kV feeder line. Admittedly, the bird wasn't a whooper but the bang it caused when it contacted the line was a whopper.

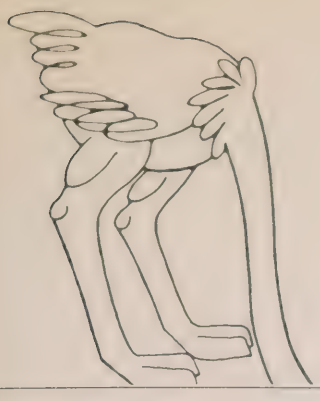
The name of the late A. P. Graham, long-time manager of Markham Hydro and clerk of the former village of Markham, will live on in the community. A Hydro substation has been named in his honor and was officially opened recently by Ontario Hydro chairman George Gathercole. M Graham's public service career spann 43 years.

Jabez Rands, former manager and year veteran employee of Clinton PUC died at age 72. A life-long resident of C ton, he was credited with knowing mo the community's history than any othe ing being and at the time of his death working on a special history book to c memorate the town's centennial.

It was Frank Murdock Day recently Wallaceburg when civic leaders, co-workers from Wallaceburg Hydro and host of friends turned out to pay tribut him upon his retirement after 50 years service with the utility. Highlight of the was the official opening of a new substation bearing his name.

Former Renfrew Hydro manager and year Ontario Hydro veteran employee Kenneth S. Gemmel, has died at age 7 Mr. Gemmel joined Ontario Hydro in 1 and worked in Eugenia, Markdale and rie before being named plant superint ent at Cheneaux Falls generating stat 1950. Nine years after that appointme went to Pakistan for two years on loar Hydro to the Colombo Plan. When he retired from Ontario Hydro in 1961 he accepted a position as manager of Re frew Hydro.

Tilbury's former mayor, Joseph Geor Young, died on his 51st birthday at a ham hospital. Mr. Young was mayor f years and started his public service c in that community in 1958 as town co lor. Well known in OMEA circles throu out the province, he was president of District 8 in 1970-71.



as don wright sees it

Something which continues to puzzle us is is whole business of establishing priori- is for those matters which must be wed with alarm.

This is not to suggest that there is any arth of dire things against which to direct editorial ire. But in this business one es not ride forth in all directions at once. e trick is to set one's sights on the same rible topic everyone else is aiming at and he same time.

t would be gauche, for example, to scribe doomsday in terms of over- ulation at this particular point in time. o or three years ago, fine — but not v.

Almost as unacceptable would be a ce on pollution. Man has been done in his own effluence in a thousand timely torials alerting him to the deadliness of rising tide of coffee grounds, beer cans old rubber boots. But that was last r.

Old-timers will even recall the olden s when our fate hung suspended from a miles of copper wire. That was the era en armageddon took the form of red tel- ones, button-pushing and points of no rn.

f the solutions to these little teasers e been found, they have been kept from In the meantime, we have moved on to energy crisis and it's still possible to ntificate in this area without being con- ered entirely out of touch.

What's new in the way of disaster? Don't ntion inflation. That's a problem which n't been playing strictly by the rules. It's ickler and is regarded as an ace up the orial sleeve for use by hard-pressed rm viewers regardless of the season.

Sniffing the air, we detect the faintly d but not entirely unpleasant smell of ney. And there are signs to suggest that lack of this commodity in the necessary nages could form the basis of the next s.

t's all a bit complicated but some of the boys in the U.S. utility business are ing up nights with billions in boodle g round in their noodles. Only the ighty can make cheap electricity these days and megabucks are getting harder and harder to find. Several state-side utilities have already drawn in their expansion horns due to financing problems.

Most of us have had some practice worrying about money and we shouldn't have too much trouble working up into a national dither over dollars.

Seems like we can only worry effectively about one thing at a time. Solutions or no solutions, it's time for the fellow who runs the world's worry machine to slip in another slide.

■ Environmentalists may welcome the money shortage for its salutary effects on the environment. Contrary to popular belief, lucre really is filthy and hard to get rid of.

The Federal Bank of San Francisco has old money to burn, and in the process it's been cited 13 times for violation of state air pollution rules. It faces fines of $500 for each infraction — presumably in bills which still retain their snap and crackle.

Each year the U.S. destroys about $10 billion in worn paper currency weighing about 2,500 tons. Incineration is too dirty and processes are being explored to convert the bills into such products as roofing felt and insulation.

"Money is hell to destroy," says the vice-president in charge of currency destruction for the U.S. Treasury. "If a clean method is not found, I just don't know what we will do."

For one thing, they might hire us as general manager. Getting rid of money is the kind of a challenge that turns us on.

■ Equally environmentally damaging, it seems to us, is the switch by some utilities from wooden to concrete power poles. Admittedly, there is a shortage of the wooden variety but think of the devastating effect this callous substitution could have on our woodpeckers. Let's make sure Hydro isn't responsible for creating a new generation of bent-billed, power-pole peckers.

■ Something else worth worrying about is the number of bad eggs in this country.

Egg experts estimate that enough eggs have been destroyed to whip up an omelette big enough to cover the core of downtown Ottawa, including the parliament buildings.

Might be a mite lumpy but the idea is sound. Waste like this isn't exactly chicken feed and the people concerned have nothing to cackle about.

■ And there is that rather weird little controversy up Georgian Bay way over Hydro extending its distribution network to serve some of the islands via underwater cable. Some say aye and others say nay, but the nayers come through as rather a snobbish lot. One of their spokesmen, obviously of the landed gentry, seems to imply that newcomers to the area aren't up to very much.

"These new people", says he, "would probably be the type who like electricity. The quality of the area will deteriorate."

We don't think this is necessarily so. Some of our best friends like electricity and we'd be proud to have one in our own family.

■ We don't usually laugh at other people's typographical errors because they have a way of coming back to haunt us, but we couldn't restrain a small guffaw at a recent blooper in the Globe and Mail.

"Ontario Hydro announced a shakeup at the senior management level yesterday," the story starts out, "to make it more like a business coronation."

Maybe they're just taking our new status as a Crown corporation too seriously. □

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the cover

Two additional heavy water plants, similar to the Bruce plant shown at night, will be built by 1978.
See article starting on page 10.
Cover photo: Harry Wilson

Robert Crichton, Editor
Paul Page, Design Direction
Bill Flett, Design

hydro news, volume 62, number 1

Published by Ontario Hydro, 620 University Ave., Toronto.

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Printed in Canada.

Sorting out the facts

The need to prolong the life of our energy resources through conservation is no longer in question. Recent stock-taking reports by industry and government have eliminated any hope that we can continue our wasteful ways indefinitely.

But it is a complex business and people are worried and confused about their roles as individuals and their seeming inability to influence the direction in which things are moving.

Perhaps the most important contribution we can all make is to accept the need to regard our resources as precious and non-renewable. This implies an obligation to acquaint ourselves with the facts and to support sound measures to make the most of our resources.

It is all too easy to find ourselves espousing approaches which have not been fully thought out and may even lead in directions at odds with the basic objective. The role of electricity in the total energy utilization picture is a case in point. It is complicated and prone to oversimplification.

Electricity is manufactured in Ontario with the use of gas, oil, coal and uranium as well as water power, and its consumption contributes to the depletion of our resources. But the extent to which this is true is not always appreciated.

The fact is, only a small percentage of electricity produced by Hydro is derived from gas and oil. Of all the energy made available by Hydro in the first 10 months of 1974, only 5.1 per cent came from gas and about .1 per cent from oil. Coal accounted for 22.7 and 15.7 per cent was nuclear. Hydro-electric power contributed 41.7 per cent, and the rest was purchased.

Virtually all the coal consumed came from the United States and while Hydro intends to meet some of its increasing requirements from Canadian sources, coal is the most plentiful of fossil fuels. Supply poses potential problems but not reserves.

Uranium is the one fuel indigenous to the province and with intelligent management the supply can be more than adequate for Ontario's needs in the foreseeable future.

With a major oil-burning station about to commence operation and another planned, it is obvious that Hydro's use of oil will increase in the years ahead. Again, the effect should be kept in perspective.

Both stations would be used to meet peak demands, with an annual load factor of about 20 per cent. This means the plants would operate about one-fifth of the time.

Hydro plans to operate these stations on residual oil. This is what remains after such products as gasoline, heating oil and a wide range of petrochemicals have been removed.

Conservation must be practised in context with the full energy supply situation. Coal is not a desirable fuel for direct use by residential and most industrial customers. Uranium cannot be utilized directly. Oil and gas are in short supply. It follows that electricity is a key element in arriving at the optimum use of energy.

The long-term trend will be towards the greater use of electricity as a means of preserving premium fuels and converting less desirable and more abundant fuels to a clean and versatile form of energy.

A man of many interests

Hydro's new chairman

by Bill Settatree

On weekends you might find Bob Taylor hiking with his wife Marian along the Bruce Trail, playing golf, or see him canoeing in Muskoka. In the winter he skis.

He likes the outdoors.

But the rest of the time it's strictly business.

At 60, after 25 years with the nation's largest steel producer, the Steel Company of Canada, Robert Berkeley Taylor might have been considering retiring as vice-president and treasurer to enjoy such pastimes to the fullest.

Instead he found himself heading the board of one of the world's leading utilities on the threshold of the most challenging period in his career. He succeeded George Gathercole as chairman of Ontario Hydro on January 1, having served as vice-chairman since March, 1974.

A complex man, Bob Taylor combines the characteristics of the decisive business executive with those of the humanitarian and academician. His initial Hydro involvement can be traced to a sense of social responsibility which led him to accept the invitation to serve on the steering committee of Task Force Hydro. He had reluctantly turned down an earlier opportunity to participate in the work of the Committee on Government Productivity because he couldn't spare enough time to fill the role as he thought it should be handled.

His membership in the Canadian Association of the Club of Rome suggests his concern for the fundamental social problems the world must sort out. The Club of Rome's purposes are to foster understanding of the varied but interdependent components — economic, political, natural and social — of the predicament that faces mankind; to bring new understanding to the attention of policy makers and the public around the world and in this way to promote new policy initiatives and worldwide co-operation and action.

Unrestrained growth is among the club's concerns and Mr. Taylor sees growth as among the major problems facing Hydro in the years ahead. He says that planning and controlling the growth of Hydro will be high among the priority tasks of the board and management.

This won't be an easy task. Convinced that the trend will be towards electricity as fossil fuels become depleted, Bob Taylor accepts that continuing expansion is necessary for Hydro. But he recognizes that this will bring problems. He suggests that one of them could be the growing complexity of communications and the difficulties this could present for employee morale and the effectiveness of the whole organization.

People are a principal concern of his. He has high praise for the character and dedication of the men and women who make up Hydro.

"I can't put my finger on the genius of Hydro people. They're at once friendly, knowledgeable and above all convinced of the basic goodness and worth of the work they are doing."

Hydro and its personnel have a central mission, Bob Taylor believes: to act as a delivery agency for electricity.

With respect to this role and Hydro's overall function, he's optimistic that the recent reorganization of the top administration with the creation of a corporate office is a start towards a more flexible and responsive management pattern.

"There are now four people (the president and three vice-presidents) in the corporate office who are trying to free themselves from operating matters and to concentrate on broad objectives and policy development. The day-to-day administration is in the hands of seven general managers," he said.

He also has definite views on the division of responsibilities between the Hydro board and the administration. The chairman will serve the board as the presiding officer concerned with policy and relations with the government and public, while the president will be responsible for the operation of the corporation.

"We must leave management to the managers," says Mr. Taylor. "For the most part, but with some exceptions, particularly in broad policy issues, we expect management to take the initiative with the board reacting to their recommendations. I see Doug Gordon as both the top manager and the liaison between management and board. To me the words 'managing dire tor' tell more of this function than does official title of president."

He says the Hydro board is kept bus than other boards he's known and he hopes to reduce the workload this yea

"Under the old setup the commissio ers were expected to be involved ever week. The board will try to centre its at tion on matters of policy and shouldn't have to meet as long or as often."

Mr. Taylor was asked to compare th Hydro board with a board in a private industry like Stelco.

"It's similar but has much more resp sibility. In private industry while directo are elected by the shareholders they a nearly always nominated by the presid with the approval of the current board. they tend to be a more closely knit gro than the Hydro board which is appoint by the government from a variety of pu with which Hydro deals."

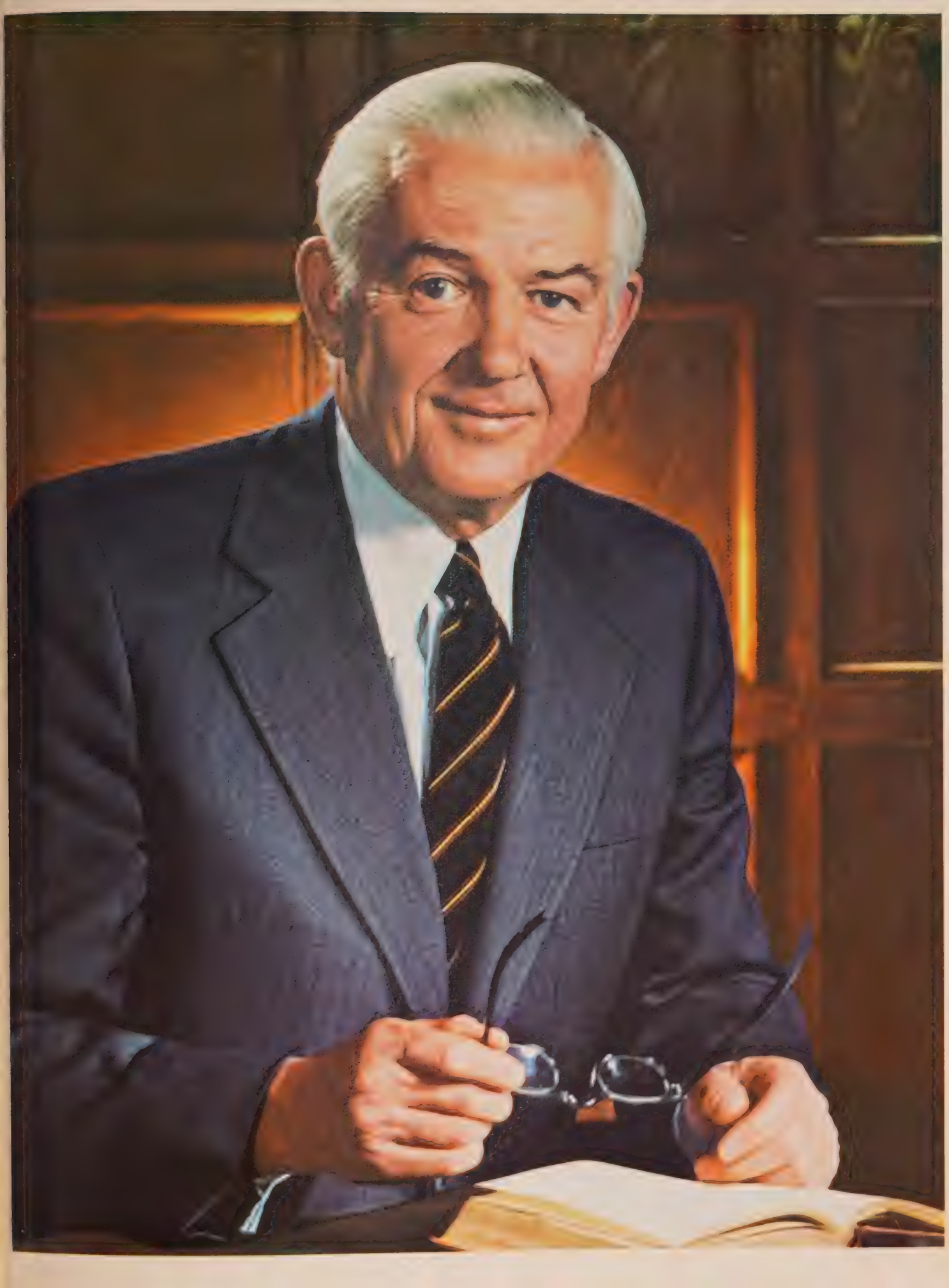
Mr. Taylor feels it is important that t reporting relationship between Hydro the government has been clearly defir The Hydro Board reports directly to th Minister of Energy, normally through t chairman. He believes Hydro and the i istry must now work to define their res tive areas of responsibility more specifically.

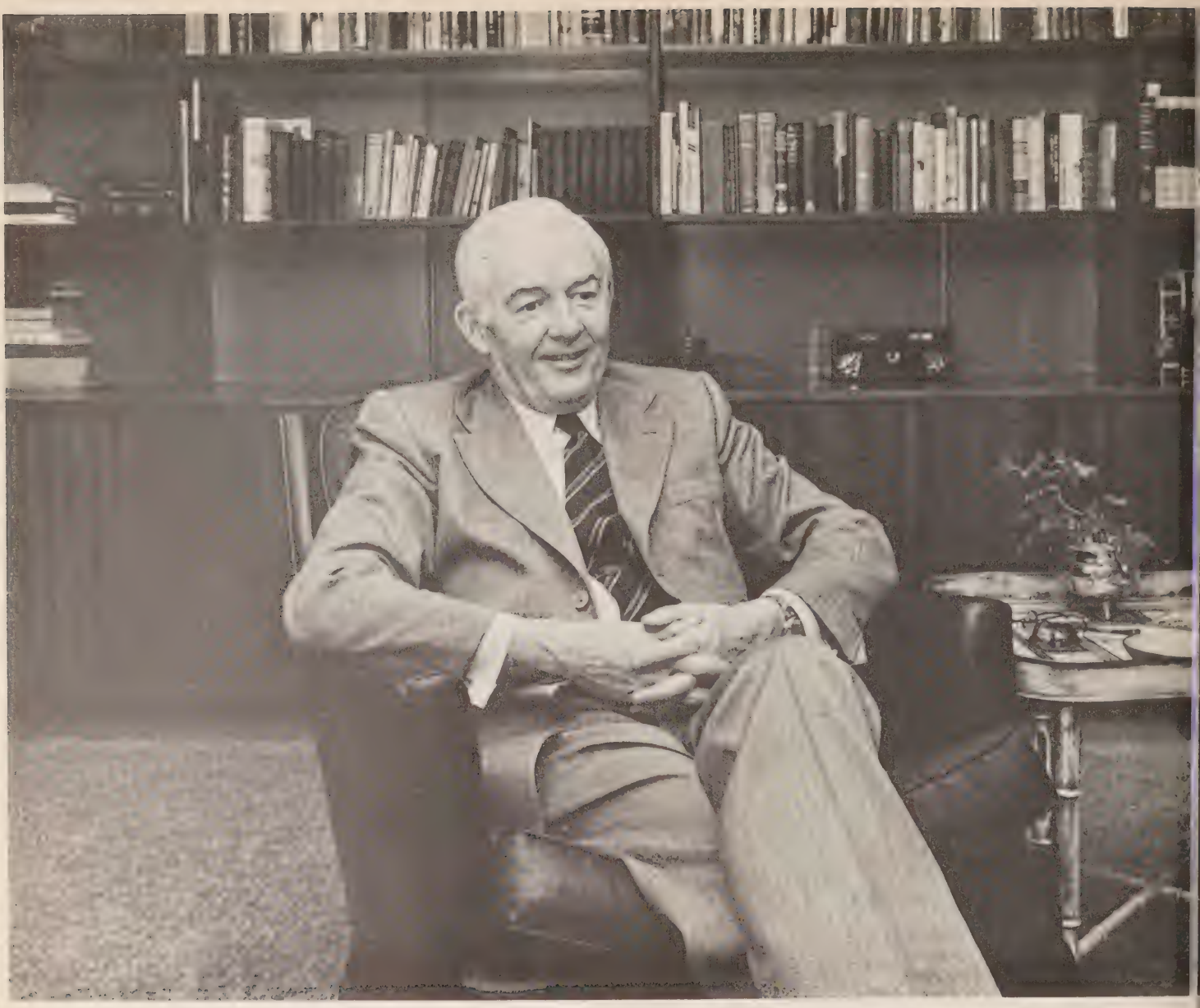
He says the board is a good buffer well as a good liaison between Hydro' management, the government and the public.

"As far as I'm concerned, a good r son for having a crown corporation wi board of directors representing a broa spectrum of interests is that it tends towards a more open approach to Hy affairs and possibly greater public acc ance. Futhermore, most people in bus understand the workings of a corpora and a board of directors — with mana ment proper reporting to the board.

"Another advantage is that it signa distinct change from the past. Task F Hydro believed this was important."

Related to the growth of Hydro and views on the environment is Mr. Taylo





strong belief that energy conservation is a must in today's society.

"We must all of us learn that to conserve energy is to conserve our environment and our resources," he says. "Hydro is trying to show the way and it must encourage the orderly development of long-term conservation habits. Crash programs can have serious consequences for all concerned. But ultimately it is the consumer who will win the battle against energy waste."

Hydro will be able to cut back on its construction program in the 1980s only to the extent that its customers give solid indication that all have firmly grasped the conservation ethic, he says.

"We have to become savers as well as users."

"There must be long-term evidence that society has learned to regard energy in all its forms as a precious and rare commodity and one whose many benefits must be paid for, sooner or later, not just in dollars and cents, but in trade-offs with environmental and social values."

Mr. Taylor sees strong municipal electric systems, and utility associations like the OMEA and AMEU, as having important influences on Hydro. He also welcomes the voice of environmentalists and such groups as the Association of Direct Customers of Ontario Hydro, as means of ensuring that all sides of each question are fully considered.

The new chairman has little difficulty reconciling his views on the need for economic development with his love of nature. Nature has always been an important facet of his personal life.

The Taylors require very little encouragement to head "up north," summer or winter. "Up north" refers to their cottage near Algonquin Park. On summer weekends the Taylors like to paddle and fish. "We have a chain of half-a-dozen or so lakes that we can get to by portaging and we really enjoy it," Mr. Taylor said.

Perhaps his love of the outdoors ha been inherited from his father — an a conservationist when it was not stylish be one. Bob Taylor recalls that his fat dentist, often became frustrated and depressed over the obstacles that we placed in the way of conservation.

Yet Dr. Taylor persevered and in 19 saw the fruits of success with the esta lishment of the Kettle Creek Conserva Authority at St. Thomas, where he hac practice and where Bob and his twin brother Jim were born. They have a younger brother Gordon and a sister

The family lived in difficult times. T was always food on the table but no m to spare.

In fact, Bob Taylor took an extra ye high school because there were no jo He was not an all-round good student did well in physics and math.

Perhaps that's what made him turn banking in 1934. That, plus the fact th



Relaxing in his favorite chair is something Bob Taylor might have been doing more of had he not accepted the Hydro chairmanship. Along with his wife Marian and their 15-year-old dog Nicky, Bob Taylor enjoys what leisure time he does have to the fullest.

was the only job he could find. He joined the Dominion Bank in London, Ontario, at a salary of $33 a month and continued his schooling through a course sponsored by the Canadian Bankers' Association. When he completed the course three years later he stood second in the entire country. His $75 tuition was refunded and what with a $25 prize he had won in an essay contest Bob Taylor decided it was time to go to university. His twin had already spent three years at the University of Western Ontario and Gordon a year.

"We pooled our resources. They put up more than I did but we finally managed to make it." He graduated in business administration.

The Taylor boys were probably considered radicals in their day at college. Bob recalls how he and his two brothers balked at the initiation ceremonies for freshmen and finally succeeded in having the rites suspended. He recalls, too, how a group of students, of which he and his young brother were among the leaders, organized marches on Queen's Park to protest cuts in university grants.

During the summers he got a job working for Hydro as one of the non-engineering professionals Hydro was trying to encourage to join the staff.

During his last year at university, one of his lecturers came down with the measles and being the only student with any business experience, Bob was asked to take the class during his absence.

"It went on for two months. I think our class did well. Anyway, at the end of the school year I was offered a job."

He eventually became an associate professor in the faculty of business administration at Western.

Bob Taylor's teaching career was interrupted by the war. He joined the Canadian navy in 1942 as a sub-lieutenant.

After completing basic training he once again found himself teaching. This time it was navigation. He was eventually appointed first lieutenant of the Corvette HMCS Dundas and soon took over as skipper.

Back at Western, he continued teaching while articling with a London firm to obtain his chartered accountant diploma.

"I enjoyed teaching very much and sometimes wonder why I ever left."

But the Taylor influence was to remain at Western. Bob contacted his brother Jim, then teaching at the University of British Columbia, and suggested he come back to Ontario to replace him. This he did and today he is a senior professor at Western's Richard Ivey School of Business Administration.

When Bob Taylor went to Stelco his plan was to stay only three years, just long enough to get business experience before resuming teaching. Instead he stayed 25 years and worked his way to a top executive post.

The reorganization of the company's two pension plans from the original 1918 version to the highly regarded plans of today was a matter in which Bob Taylor played the leading role.

He was the company's liaison man with historian William Kilbourn, now a Toronto alderman, who had been assigned in 1957 to write a history of Stelco. In his book, "The Elements Combined", Kilbourn paid tribute to Mr. Taylor's patience, kindness and sound advice. Later he said passages dealing with the responsibility of business to employee welfare and to the community in which it operates were "pure Bob Taylor."

One secret goal Bob Taylor has never achieved though is to be an actor. He once played the part of a butler in a university play but gave up after the adjudicator complained that she couldn't hear a thing the butler had said.

Now he's at centre stage as the curtain rises on a new era in the development of Ontario Hydro. □

The Gathercole years

by Rae Hopkins

A hint of grey threads its way through the gingery-brown hair he had when he took over at the helm of Ontario Hydro almost nine years ago.

But there's still plenty of it — and he looks a full decade younger than his 65 years.

George Edward Gathercole retired as chairman and chief officer of Ontario Hydro at the end of 1974.

He has been succeeded by Robert B. Taylor, former vice-president and treasurer of the Steel Company of Canada Limited.

Mr. Gathercole has seen many changes – most of them significant, some of them sweeping — in the years he has held the top post at Hydro.

However, if he were to single out one accomplishment that he considered outstanding during his tenure, Mr. Gathercole would tell you that it's that Hydro has never failed in all those years to meet the electrical needs of the people in Ontario.

Not only did Hydro meet the demand for power, Mr. Gathercole points out, but it did so at the same time it was moving into an area of dramatic technological change and full public participation which imposed great strains on scheduling and bringing facilities on stream.

It was during this period that Hydro had developed its principal water power resources and moved into a massive thermal-electric, including nuclear, power program.

"Meeting the demand for electricity has certainly been the goal of everyone in Ontario Hydro. But it's not enough just to meet demand, it must be done at the most reasonable cost. And it sometimes seemed as though this had to be done without the visibility of generating stations and transmission lines.

"When I became chairman," Mr. Gathercole adds, "I considered the most challenging task facing Hydro would be to ensure there was a realistic balance between Hydro's electric power capacity and the demand for it, neither on one hand overshooting the mark and creating an excess of capacity which would add to costs, nor, on the other, falling short of meeting the essential needs of Ontario which would cause even greater distress and economic loss. I believe the results speak for themselves: we did achieve that objective."

When Mr. Gathercole was appointed first vice-chairman in December, 1961, Hydro's capacity was 6.7 million kilowatts. Today it is 18.2 million kilowatts — more than 2 1/2 times as large. Mr. Gathercole says, "We built $4.3 billion of plant assets, met all demands for electricity and left our credit rating both in Canada, the U.S. and elsewhere as strong or stronger at the end of the period than it was at the beginning."

And, Mr. Gathercole points out, "this expansion has been and is being carried out during periods of rapidly changing attitudes toward environmental matters. People are not only more sensitive to elements that debase the quality of the air and water, but also to the intrusion of transmission lines and towers on the landscape.

"They sought a bigger voice in the direction of Hydro affairs — where generating plants were to be sited and lines routed — and Hydro responded.

"We've responded by adopting what is probably the most advanced and comprehensive public participation program in the world."

Mr. Gathercole observes that this process has greatly extended the time required to bring facilities into operation and inescapably has increased the cost of them.

"But", he says, "it recognizes the public's right to its say as part of the democratic process by which the interests, concerns and points of view of the people of this province can be given full consideration.

"It is to be hoped that in time the decision-making process can be shortened in a manner that will both serve the public interest and at the same time fully protect that interest."

While rates for electric power have increased significantly during this period of change, Mr. Gathercole points out that in real terms after allowing for inflation most customers are paying less per kilowatt-hour of electrical service today than they were a quarter-century ago.

"The price of most commodities and services has increased more rapidly tha electric power rates. This is true for all r dential, commercial, and farm custome he adds.

Then there was the move into an unprecedented nuclear program compl with attendant teething problems at the pioneer Douglas Point plant that cause one opposition member of the Legislatu to term it "Hydro's billion-dollar blunde

However, Mr. Gathercole suggests t it was inevitable that questions would a when Douglas Point was not performin satisfactorily as Hydro might have hope

"I recognize the immense stake Ont had in the outcome. We were well into struction of the 2,000-megawatt Picker station and had committed the 3,000-megawatt Bruce development.

"What was involved was not merely investment of more than $2 billion — important as that was. The even more issue was that if these plants failed to deliver an acceptable level of output H would not be able to meet the growth i demand for electrical service and the p ince's economic growth would be arre

"We knew we were taking risks. No question about that. But there was no a native. We had run out of major water power sites, and to have exposed Onta to the increasing dependence and vag ies of supplies of fossil fuels would hav been to incur even greater risk. The Pi ering nuclear station was to be the aci test of the Canadian nuclear power pr gram.

"It had taken 100 years to bring fos fuel-fired generating stations to a state high efficiency.

"The scientists and engineers of At Energy of Canada Limited and Ontaric Hydro were trying to achieve the same degree of success through a process uses uranium indigenous to this provi in a quarter of the time. It was a formic challenge on which more than one co has foundered. We should not forget t

Of the basic soundness of the Can concept there were few doubts. This h been demonstrated at NPD, but the st ing performance of the 200-megawatt Douglas Point plant did leave unansw

There's an old adage about a picture being worth a thousand words. These are the Gathercole years




















the question of how effective the Pickering and Bruce nuclear stations would be in meeting the demand for energy. Although many were confident, nobody could be sure.

Compounding the lack of practical operating experience was the shortage of heavy water, without which Hydro's nuclear plants could not operate.

Canada at this stage was not producing any heavy water and the Glace Bay plant was to prove a disaster. Equally significant, only limited and inadequate supplies were available throughout the rest of the world, principally the United States, and worse, no efforts were being made to expand them.

"Were we erecting expensive monuments to our own folly as some of our critics affirmed? It was clear that if our needs were to be met it was going to be by getting into the production of heavy water in Canada," Mr. Gathercole says.

The Canadian General Electric plant was committed at Port Hawkesbury and this was followed later by AECL agreeing to build and Ontario Hydro to commission and operate a much larger plant at Bruce.

It was not until early 1973 that the intricacies were mastered and quantities of heavy water began flowing out of the spout. It was a dramatic break-through that reflected great credit on the technical staff.

However, this success did not come until later. At the time Hydro was also concerned about the high capital cost of nuclear capacity — more than double that of conventional fossil-fuelled plants — and its demands on the money markets.

Because of the factors — and particularly the lack of experience and heavy water — a proposal to build two Bruce nuclear stations was shelved in favor of one nuclear station of 3,000 megawatts at Bruce and a 2,000-megawatt optional crude or residual oil-fired plant at Lennox near Kingston. "Nevertheless," Mr. Gathercole says, "the commitment of 5,000 megawatts of nuclear capacity in those early days had to be one of the most audacious decisions ever made by any enterprise in Canada."

Since then, Mr. Gathercole believes, the weight of advantage has swung increas ingly to nuclear power. Hydro has the c vincing success of Pickering and of hea water production at Bruce. No longer d anyone believe in unlimited supply of oi and natural gas at low prices. Coal is becoming harder to buy and much mor expensive. The only practical alternativ nuclear power and Mr. Gathercole is a strong advocate of proceeding vigorou with the doubling of nuclear capacity a Pickering and Bruce, and a station of si lar capacity on a new site at Bowmanvil

Mr. Gathercole was asked whether Hydro has ever considered installing th light water reactors used in the United States. "Not seriously", he says. "This course was advanced by some of our c ics, but it was not practicable. We coul afford to scatter our resources in that v We didn't have the technical and financ resources to do both. Besides, the Can reactor with its natural uranium is ideal suited to nations such as Canada that c not have enrichment facilities which ar extraordinarily costly. And there are ot advantages. The Candu concept was b cally sound in principle. It was a matter concentrating all our talents and resou in making it a success."

A leading economist, Mr. Gathercol has pretty definite opinions on inflatio causes and its cures. He calls it "an in ous evil written in grievous inequities a economic wastage."

And the cure, he says, is discipline restraint by everyone. This won't happ without the leadership and example of ernment, unions and business.

He contends that because of the increased diversion of income to the f ers and oil nations and producers, eve one else will have to settle for less. "B all segments of the economy try to cor pensate and get the same share of the as before, this cannot help but aggrav inflation."

And Mr. Gathercole maintains that legislative committee and the news m did Hydro a "grave injustice" in its inq into Hydro's new 19-storey head offic building.

"The decision to enter into a lease-

A familiar pose for retiring chairman George Gathercole was waiting to be driven to another speaking engagement.



purchase agreement with Canada Square Corporation was a sound business decision at the time and every day that passes makes it look better "If Ontario Hydro were to enter into such an agreement today, the cost of Hydro's new headquarters in terms of higher construction prices and interest payments over a 30-year period would be about double. That adds up to a saving of many millions of dollars to the power users of the province." The irony is that the decision to go ahead with the office building should have aroused such a furor. Risks there were, but they were miniscule compared with so many others that passed unnoticed."

Mr. Gathercole is proud of Hydro's accomplishments and its unblemished record of integrity. Hydro has a great team, he says.

The office Mr. Gathercole occupied for close to a decade was a work place, not a status symbol, and not elaborately furnished.

Indeed his desk was piled high with reports. So was the credenza behind it and a long coffee table at the side. His desk set had messages impaled on both pens and there were at least half-a-dozen briefcases sitting in a corner. They were filled with reports and news clippings too.

One of his proudest boasts is that he's never lost a piece of paper — well, only once, when he loaned someone a file and it wasn't returned.

Far from being ready for retirement, Mr. Gathercole says he feels he still has a contribution to make "and will keep active. I've a few things in mind."

One of them may be to improve his golf game — he shoots in the low 80s

One of his trademarks was the pair of heavy attache cases he carried to the office every morning and home every evening. "With all the inquiries, reviews, Hansard copies and reports, one needed a trunk," he says.

The other is the warm smile, the firm handshake and the greeting.

"The name's Gathercole — George Gathercole." □

The mating game

Hydro plays cupid with deuterium and oxygen to produce heavy water

by John Dalrymple

Ontario Hydro has always been associated with water power, but these days the emphasis is less on the ordinary kind of water that bubbles lightly down streams and over waterfalls, spinning generators as it rushes past.

Today's star of the Hydro scene is that sulkily elusive, high-priced idol of the nuclear age — heavy water.

A test tube of heavy water was a laboratory curiosity back in 1932 when U.S. physicist Harold Urey first isolated it. Now, despite teething problems, heavy water production is becoming one of the largest chemical processing industries in Canada. Hydro alone needs hundreds of tons of heavy water for every reactor in its multi-billion-dollar nuclear expansion program.

Ontario Hydro now has an installed generating capacity of approximately 17,000 megawatts. Future power demands are uncertain but it's expected the province will need 32,000 megawatts by 1982, and probably 64,000 megawatts by 1992.

Most of that new capacity will be nuclear, based on the Candu (Canadian Deuterium Uranium) system that uses Canada's abundant and relatively cheap natural uranium as a fuel, surrounded by a heavy water moderator that enables continuous nuclear fission in a chain reaction. Heavy water is also used to transport heat from the fuel to the steam generators in Pickering-type reactors.

A Candu reactor loaded with sufficient uranium fuel bundles to light a major city won't even light a flashlight without heavy water moderator. The rough rule is that one megawatt of nuclear-electric capacity requires one megagram (2,205 pounds) of heavy water.

By no means does heavy water come in the economy class. The current world price — set by the U.S., which in fact doesn't produce much of it anymore — runs about $55 a pound, or about $120 a kilogram.

As the world's largest producer, Canada could undercut that price — if Canada were selling. Battling its way through heavy water shortages because of the thrust of its nuclear program, Canada generally is buying, not selling, at least until new plants are in production.

Ontario Hydro and Atomic Energy of Canada Limited have set up a pool agreement to ensure that heavy water supplies are available on an equitable basis. AECL administers the pool and deals with the other Canadian supplier, Canadian General Electric's plant at Port Hawkesbury, N.S., and offshore suppliers in the U.S., Sweden, Soviet Union and the U.K., averaging out the prices against the priorities.

The pool price to Hydro these days runs about $66 a kilogram, but the agreement expires December 31, 1977, or whenever the Bruce A generating station demand is filled, whichever comes first. After that, Ontario Hydro can expect to be on its own for making or buying its heavy water, expected to equal all other Canadian demands.

Besides proposed expansion at Bruce, two other Canadian heavy water plants are in the offing. Production is scheduled to start this year at the Glace Bay, N.S. plant, which is being rehabilitated by AECL. AECL has also awarded a contract for another heavy water plant at Gentilly, Quebec. But output of these plants is expected to be dedicated to supplying Candu reactors in other provinces and abroad.

Thus, Ontario Hydro is immersed in a massive program to make itself self-sufficient in heavy water just as quickly as possible — hopefully by the 1980s. A reliable supply is just as essential as uranium to Hydro's program.

Ontario Hydro's first major plunge into the stormy seas of heavy water production was Bruce Heavy Water Plant A on the 2,300-acre Bruce Nuclear Power Development site near Kincardine.

Built by chemical engineering contractors Lummus Canada, under contract to AECL, it was purchased by Ontario Hydro for $255 million. It produced its first trickle of 99.75 per cent pure reactor grade heavy water on April 3, 1973.

Bedevilled by construction, design, labor and processing problems that had included slight impurities in the feedwater, bubble-bath foaming in the mass transfer trays in the 275-foot-high (82.5 metres) towers and other headaches, the Bruce staff had every reason to celebrate the occasion. Since then production has been moving into high gear.

From first production in April, 1973, to September 30, 1974, Plant A's two enriching units feeding into a single "finishing" unit produced a total of 761 megagrams of reactor grade (99.75 per cent pure) heavy water, and averaged 72.5 per cent of the plant's nominal annual 844-megagram capacity during the last 12 months. During this period one enriching unit was shut down for design modifications, said David Bate, Hydro's manager of engineering for Bruce Heavy Water Plant.

Plant B, with the same capacity, is now under construction at Bruce by Lummus Canada for Hydro at an estimated cost of $382 million. It is scheduled for service in 1978. A third similar plant tentatively is scheduled to start up in 1978.

Plans are also under way for a heavy water upgrading system at Bruce.

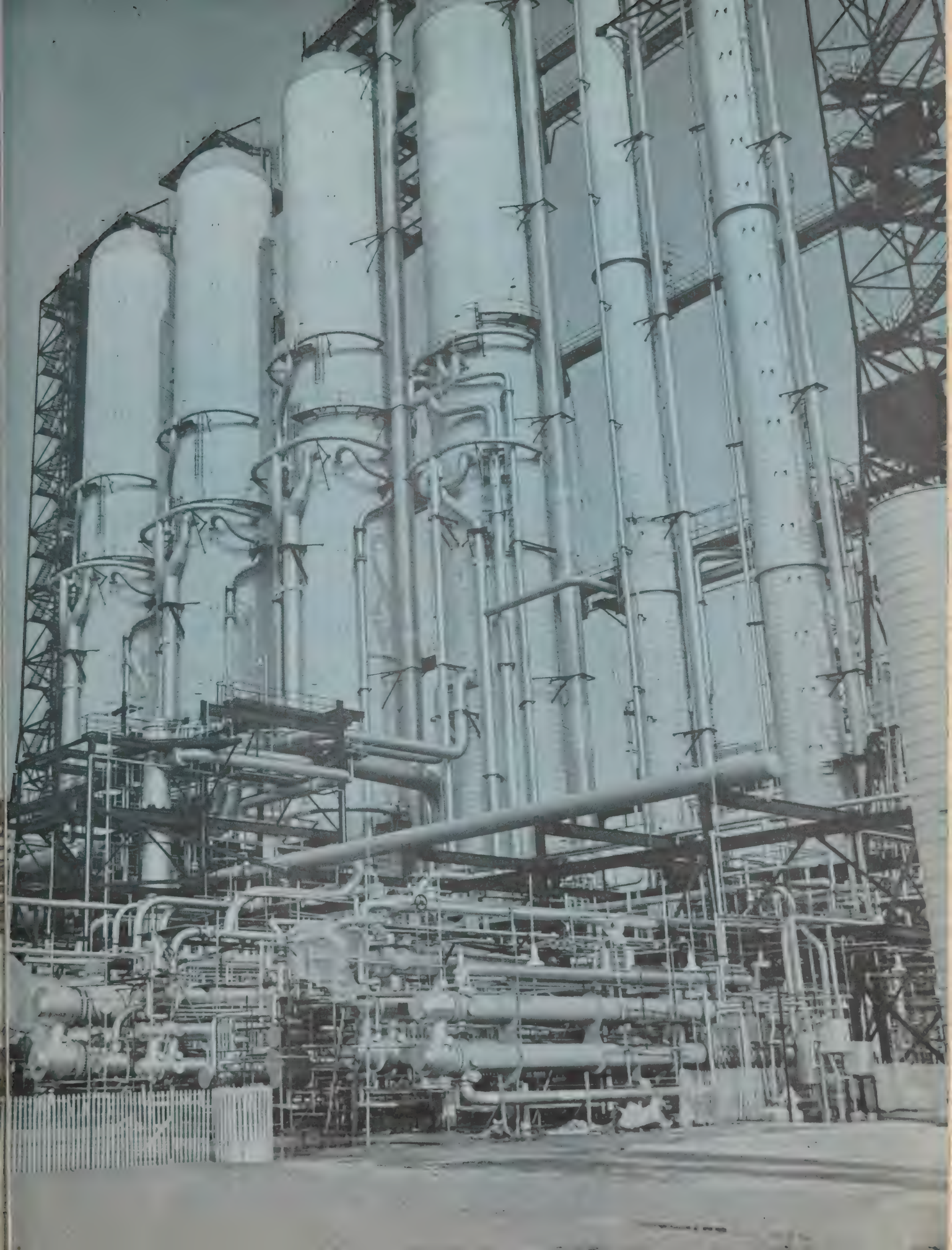
A fourth plant will almost certainly follow eventually, but plans were reviewed by Hydro's board of directors following Ontario Energy Board hearings. Original plans called for completion by July, 1979, but actual timing depends on authorization.

The third and fourth plants can be expected to involve investments on the order of $500 million each, and Energy Minister Darcy McKeough a year ago began inviting private industry to participate with Hydro in the development, financing and ownership. Besides a sure-fire customer for the product — Ontario Hydro — the participating industry would also get access to valuable nuclear technology and experience.

About a half-dozen serious proposals have been received, and talks are reportedly continuing.

Assuming all four plants were in operation, Hydro would then have dependable heavy water production of more than 2,000 megagrams (2,204 tons) a year, about

The Bruce Heavy Water Plant A produced its first heavy water on April 3, 1973.



matching projected needs. Working at full capacity, each of the plants could produce 100 kilograms (220.5 pounds) of heavy water an hour by sucking in 6,000 gallons (27,276 litres) a minute each of feedwater from Lake Huron. Naturally, all that feedwater has to be filtered and degassed before being swept into the enriching towers.

The heavy water that results from this massive sieving of Lake Huron looks, tastes, feels, and in most respects acts just like ordinary light water. That means the separation problem is immense.

Ordinary water, of course, is hydrogen oxide, or H_2O, in which two atoms of hydrogen latch onto a single oxygen atom.

Heavy water is deuterium oxide, or D_2O. Deuterium — a rather rare isotope of hydrogen — has a neutron snuggled into the nucleus where normally only a proton resides. The neutron's extra mass makes deuterium twice as heavy as normal hydrogen. The water that results when two deuterium atoms combine with oxygen is 10 per cent heavier than normal water. Hence the name.

There are some minor physical differences between light and heavy water, such as slightly different boiling and freezing points; some minor differences in chemical reaction speeds; some minor biological differences — mixed with good scotch, heavy water quarantees a hangover-free morning after, assuming you can afford either ingredient.

Most of all, heavy water is one of the world's most efficient nuclear reactor moderators. It's already overstuffed with neutrons and so won't absorb those released by fissioning uranium atoms, leaving them free to continue the chain reaction.

Actually, the wonder is not that the successful Bruce A plant extracts so little heavy water from its massive flowthrough of feed from Lake Huron. The wonder is that it extracts any, considering that, in effect, Lake Huron contains none at all.

Contrary to a good deal of technical literature, heavy water simply doesn't occur naturally anywhere, in any quantity.

The best nature has been able to contrive is approximately one atom of the heavy isotope deuterium for every 7,000 atoms of ordinary hydrogen. As two hydrogens must marry one oxygen to form a water molecule, the chance of two deuteriums mating with the same oxygen works out to about 1 in 49 million. Even if you managed to buck those odds to find a natural heavy water molecule, it would naturally break up before you managed to scoop it in.

"The atoms in water are completely promiscuous," sighs Graham Keyser, supervising engineer of the science and electronics section in Hydro's Research division. "They switch partners randomly from instant to instant. No stability. No fidelity."

The result of this polygamous hydrogen-deuterium orgy in Lake Huron, and all other natural water, is a group of mongrel molecules of "half-heavy" water, with the formula HDO. As these share the characteristics of both heavy and light water, they complicate separation even more.

Obviously, if you want to end up with hundreds of 45-gallon steel drums of D_2O when nature can barely afford to keep a few temporary molecules on hand, those 49 million-to-1 odds have to be tipped substantially. Putting in the fix is a tricky, highly expensive proposition. The lure of winning can be gauged by the fact that more than 100 gimmicks for producing heavy water are already known, and scores more are being probed.

So far, the only well-proven industrial-scale technique is the Girdler-Sulphide ion separation process, used by Ontario Hydro and all other North American plants.

The details are delicately complex, but the basic idea is simple. With hydrogens and deuterons holding a switch-partners dance, the separation trick is to supply slightly more attractive deuteron partners alternately on one side of the atomic dance floor, then on the other. As they bustle back and forth, pursuing their immediate inclinations, concentrations of deuterons can be diverted off to similar second and then third stage enrichments.

For reasons best known to atoms, deuterons yearn more ardently than hydrogens to dance with hydrogen sulphide molecules when the weather is hot; they are more eager to clasp water molecules when the weather is cold.

So, in the G-S process, water cascades down from tray to tray and through alternating cold (90 degrees F — 26C) and hot (262 degrees F — 124C) sections in the pressurized towers, while hydrogen sulphide gas bubbles up in the opposite direction.

The hydrogen sulphide, used over and over in a closed cycle, transports the fickle deuterons through second and third stage enrichments. The process is about 20 per cent effective. Original feedwater from Lake Huron to the first stage has a deuterium isotope content of 148 parts per million. It is discharged to the lake still containing about 120 parts per million.

But, after the third enrichment stage, the resulting water is rich enough in deuterium to be fed to the finishing unit. There, the 2.6 degree F (1.5C) difference in boiling points between light and heavy water is exploited by fractional distillation to produce reactor grade heavy water.

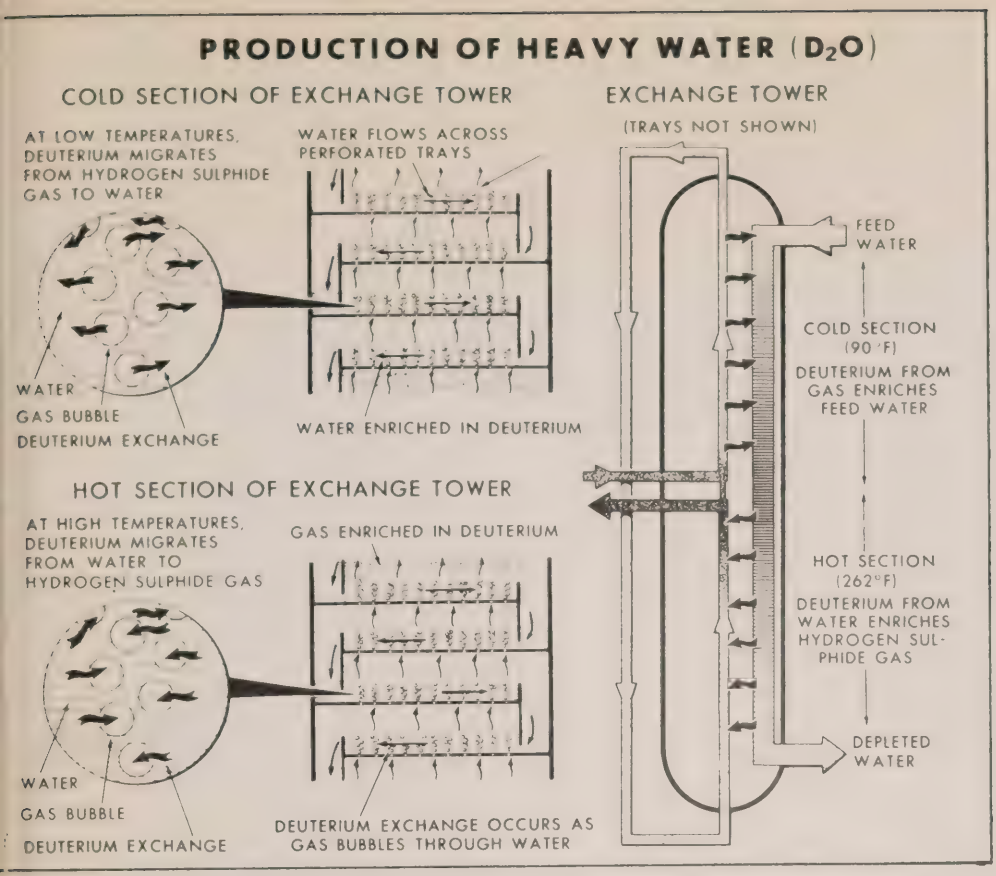
The finishing plant is essentially just a still — a close, but highly sophisticated relative of the apparatus used to distill water in a laboratory.

As Hydro pushes ahead to become self-sufficient in heavy water, design improvements are being incorporated in Plant B, now under construction, and the third plant, still in the paperwork stage.

Process difficulties that plagued the start-up of Plant A have now been pretty well solved, though experimenting still goes on, says J.K. Armstrong, technical superintendent in Hydro's central nuclear services.

The problem of foam build-up in the trays that hampered early production has been overcome partly by redesigning the trays, partly by additives in the feedwater, partly by careful balance of gas and liquid flows, and partly through deeper knowledge of the entire process.

Putting in additives at the start of the process means problems in removing them later, and Mr. Armstrong hopes for design



mprovements that might eliminate the need for them.

Despite the sizeable investment involved in heavy water plants, Mr. Armstrong points out this is still a relatively small component in the over-all cost of a nuclear plant.

"With the four heavy water plants we feel necessary now, we should have a long-term dependable annual production of over 2,000 megagrams a year — which won't really become mature and dependable until the early 1980s. That would just barely support a nuclear program at that time of only 2,000 megawatts of new generating capacity a year. It's likely heavy water is going to be in tight supply for a long time to come," Mr. Armstrong says.

On the laboratory frontier, research goes on to find simpler, cheaper processes than the present G-S system. But even if proven tomorrow, plants using them would still be 10 to 30 years in the future.

At Chalk River, a team has been working for seven years on a promising process involving the exchange of deuterium between hydrogen and methylamine, says Dr. Howard Rae, AECL heavy water development process co-ordinator. The process needs a feed of pure hydrogen from some industrial source such as a fertilizer plant.

AECL and a Swiss group are now exploring the possibility of setting up a prototype plant in Alberta in conjunction with an ammonia manufacturing operation.

Another process AECL is working on is a hydrogen-water exchange that involves a special — and expensive — platinum catalyst. "That one is still quite a distance from being economically competitive with the G-S process," Dr. Rae admits.

While AECL is concentrating primarily on chemical processes, Hydro researchers are focussing their attention more on physical separation processes, says Graham Keyser.

Several hopeful avenues are being explored.

One involves selective activation of deuterium atoms by a laser beam that leaves the hydrogen atoms unaffected. For this, the laboratory has recently acquired an exotic laser, of which Mr. Keyser is especially fond. It is capable of precise tuning to deuterium's reasonance frequencies.

The lab is also experimenting with the distillation process, both in an effort to improve the present finishing plant and also as a process that might do the entire separation itself.

A third approach is biased thermal diffusion, somewhat related to methods used to separate uranium isotopes in the U.S. And then there is dielectrophoresis which involves trying to line up the lopsided "half-heavy" water molecules in an electric field to see if they can be made to march off into a cage like good little soldiers. This one has left everyone scratching their heads because the perverse apparatus seems to work quite as well when it is turned off as when it is turned on.

The high cost of heavy water bothers Mr. Keyser because it is caused almost entirely by the vast amounts of energy needed to paw repeatedly through millions of atoms to finally snag the few desirable ones. This is one reason heavy water plants are best located close to nuclear stations, which can supply an economical source of steam. (Bruce generating station, for example, will be supplying steam to the adjacent heavy water units.)

Yet thermodynamic theory, Mr. Keyser says, indicates that an ideal separating process could yield a kilogram (2.205 pounds) of heavy water for an energy cost of less than 17 cents. Between that theoretical minimum and the current $120 world price, there seems plenty of elbow room for new and cheaper approaches.

He gets especially uptight when he thinks of Pickering's four units pulling in 1,250,000 gallons (5,682,453 litres) of cooling water a minute from Lake Ontario. This means that in one day more than 1,200 tons (1,088.5 megagrams) of precious heavy water are pumped through the condensers and fed back to the lake, doing nothing more profitable along the way than cooling some tubes.

"There must be some kind of super sieve, or strange sort of magnet, we could dip in the water to sort out the deuterium, much the same way we now remove the fish," he speculates.

"We don't have any magic process yet," Mr. Keyser says. "But we do have excellent hopes that the plants Hydro will be building in perhaps 15 years will be based on processes different and cheaper than the G-S process."

So far, however, the magic process keeps eluding the researchers, slipping through their fingers — well, just like water. □

The forest ir



a greenhouse

by Les Dobson



If anyone has a green thumb, it's Lucien Forcier.

As superintendent of the Swastika Tree Nursery, Mr. Forcier is responsible for the production of about 21 million trees a year for the Ministry of Natural Resources reforestation program. Set on 2,200 acres (890 hectares) of sandy loam near the watershed that divides the Arctic and St. Lawrence basins, the Swastika nursery ships jack pine and spruce seedlings across northeastern Ontario.

Now Mr. Forcier's thumb has turned a shade greener with the development of a rapid method of growing seedlings from seed. Indeed, the news that two years' growth is being concentrated into a 10 to 14-week period has put Swastika on the map for forestry experts both in the U.S. and Europe.

Mollycoddling is the key to obtaining growth four to seven times faster than normal, depending on species. Approximately four million trees are being raised annually under conditions of strict climate control in two modest-sized greenhouses.

"We have sufficient trees in the two greenhouses to plant 1,300 acres (526 hectares) of new forest," says Mr. Forcier, "and we produce three crops a year."

The idea got started when George Brown of the Ministry of Natural Resources invited Ontario Hydro's area office in the nearby gold-mining centre of Kirkland Lake to come up with a suitable greenhouse design.

"Although Hydro had been involved with soil-heating experiments using buried cable, this was something new," says Dan Clement, sales and service representative in Kirkland Lake. "The only precedent we had was a small greenhouse operation in North Dakota.

"The nursery asked for a constant 78-degree F (25.5C) temperature during the day and 68 degrees F (20C) at night. During the week-long germination period, the temperature must be raised to 85F (29.4C). Relative humidity has to be maintained at 80 per cent."

Hydro came up with a proposal together with estimates of operating costs. It gained almost immediate acceptance. Other



Hydro personnel were kept busy during the design and construction period. Regional sales supervisor George Robertson, for one, regularly made the 300-mile (482 km) round trip between the nursery and his office in North Bay.

Each greenhouse consists of a 160-foot-long (48.8-metre) polyethylene-covered structure set on insulated concrete block walls. A chamber at one end contains the climate control equipment. The hydronic heating system consists of passing water heated electrically in three 120-gallon (545.5-litre), 36-kW units through a series of finned pipes. Eight large fans, capable of circulating the entire greenhouse atmosphere once a minute, direct the air through the radiator system.

In the cooling mode, air is circulated through a spray of cold water pumped at 44 degrees F (6.7C) from a deep well. To assist the cooling, exhaust fans and louvres have been installed. Both systems are operated automatically according to time clock and thermostat settings.

Banks of 150-watt incandescent lamps extend the daylight hours, coming on for 15 seconds every 10 minutes throughout the night. Darkness is a necessity, though, to permit the seedlings to release carbon dioxide. Average intensity of the lighting is 48 footcandles. Trees are automatically irrigated and fertilized by a tracked boom traversing the length of the greenhouse.

After attaining a height of about two inches (5.08 cm), each seedling is transferred outdoors for hardening, still encased in the small plastic tube in which the seed was originally sown. The toughened-up seedling is later shipped to one of the ministry's reforestation areas within the site region from which the seed was first collected.

Although between 15 to 20 per cent, the mortality rate for seedlings is less than that for the outdoors nursery operation, says Mr. Forcier. Greenhouse seedlings fall prey to radiation from the sun, diseases and insects.

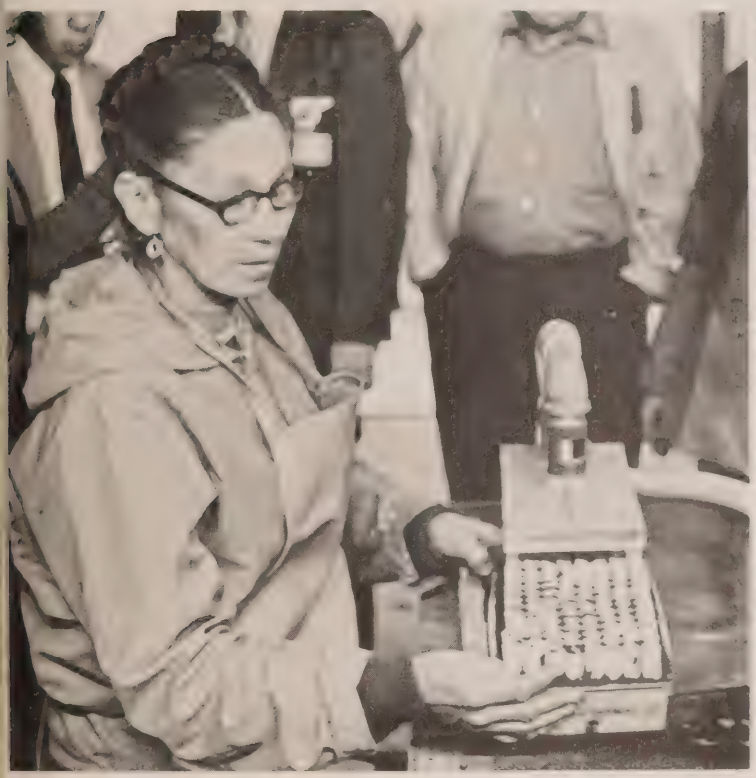
The nursery calculates the operating cost of the greenhouses at one-fifth of a cent for each seedling.

What does the Swastika nursery mean in terms of the forestry industry? Fred McNutt, president of Milne Lumber in Temagami, is worried about the increasing yields of forests elsewhere in the world compared with Canada.

"Dollars spent on this type of nursery, on developing superior, faster-growing trees, on fertilization studies and on the use of other tree species should be increased," he says.

"The Russians, Scandinavians and Americans all spend much more than Canada on research into almost every aspect of forestry and the forest industry. Perhaps those who hold the purse strings here still have the vision of inexhaustible forests stretching far into the north." □

eeds for the Swastika greenhouse operation
'e initially sown in small plastic tubes. Hydro's
ales and service representative, Dan Clement,
seen examining trayful of seedlings with
ursery superintendent Lucien Forcier. Lower
hotos show seedlings raised at the nursery
eing planted by specially-designed machine,
nd George Robertson, agricultural sales
upervisor for Hydro's Northeastern Region,
omparing seed container with tree growing
ild near nursery.







Rate review

The doors swing open to a new way of life

by Bill Settatree

The sign in the hallway directs you down the hall and around a corner to a closed fire door. You must pass through it and three more doors before you find an unimposing office in a secluded corner of the second floor annex to Hydro's head office at 620 University Ave.

This is the rate review department, where a staff of seven hang their hats. But the location and the behind-closed-doors appearance of the setup in no way reflects Hydro's attitude towards rate reviews — it just happens this was the only space that could be found to house the team when it was established in 1973.

Hydro's open-door attitude to rate review has been described as second to none in North America. Its staff went to extra lengths to make full disclosures when the provincial utility engaged in its first-ever public hearings before the Ontario Energy Board last year.

The same frankness and openness is expected to characterize hearings later this year on rates as well as a two-year review of the corporation's long-range planning.

The 1974 hearings were conducted in three stages spread over seven months. The first phase was on system expansion, the second on financial policies and the third on bulk power rates.

To provide all the information required to satisfy the board, the intervenors and the public, Hydro submitted four volumes covering 450 pages for the first hearings, three volumes comprising 340 pages for the second and five volumes with 830 pages for the third. Total tally: 12 volumes and 1,600 pages.

In addition, Hydro filed 584 additional exhibits. The hearings produced 13,663 pages of transcript. The cost to Hydro: more than $1,000,000.

Why go to all that trouble and expense? Was it worthwhile? Ted Burdette, who was manager of the rate review department from its inception until his appointment as comptroller last fall, thinks it was.

"The hearings took on a priority function within Hydro and affected the work of hundreds of employees. The unique legislation which required the OEB to hold the hearings allowed us to get things done in a way that avoided regulatory delay similar to rate application problems in the U.S."

Milan Nastich, vice-president resources, said the process provided an opportunity for Ontario Hydro staff to respond to a challenge and to test themselves in terms of the effectiveness with which they have performed their job. "The Ontario Hydro witnesses performed in an outstanding manner and as the hearings progressed I became increasingly proud of the organization and its achievements." he said.

"During the seven months of the hearing no effort was spared by Ontario Hydro to meet the requirements of rate review. The chairman, president, the assistant general managers, directors, managers and professional analysts all put rate review at the highest priority."

In all, Hydro made available 77 witnesses, each of whom spent many hours preparing for the sessions.

Mike Spence, production engineer in the Power System Operations division, was on the stand only four-and-a-half days during the first session but put in more than 400 hours in preparation.

Bruce Macpherson, capital construction program supervisor in the comptroller's division, spent 460 hours getting ready for his appearance at phase two.

Similar preparation was necessary for the 75 other Hydro witnesses, not including days and weeks spent at the hearings themselves. In some instances, on instructions from lawyer Pierre Genest, witnesses spent several days at the hearings in advance of testimony "just to get the feel of things."

Mr. Genest, a 20-year veteran of courtroom procedures, said he'd never been on a case where he had a series of witnesses of such uniform high quality.

"They were absolutely first-class, and so were all the others who spent so many hours helping to prepare our material."

Robert W. Macaulay, counsel for the energy board itself, also had high praise for the Hydro team and the submission.

"It is my view that Hydro has set a standard which has never been made or even attempted before in Ontario . . ." he said in his final argument.

Staff lawyer Arthur Gardner estimated he spent a minimum of 300 hours in overtime work alone, "and that didn't include the evenings at home reading the transcripts of proceedings which arrived every night at 7 p.m. by taxi."

Both he and Mr. Genest along with Mr. Burdette and the witnesses of the day would receive and study those transcripts at home in their "leisure time" to prepare for the following morning.

Most of the extra time was spent in room 236 at head office, a carpeted conference room which to many will always be remembered as the "boiler room". Sessions sometimes went from dusk to dawn with the occasional break for two or three buckets of fried chicken.

"The chicken bill alone must have been more than $1,000 and often they forgot to send forks and spoons. Have you ever eaten salad without a fork?" asked Mr. Gardner.

One witness, Frank Gomer, says he can't even eat chicken any more. "I used to love it but now — ugh!" he said. Mr. Gomer, now general manager — finance, was Hydro comptroller during the hearings. He is one of the few Hydro witnesses to come away with a souvenir — his own personal Superman T-shirt.

"In his argument at the conclusion of phase three, Mr. Macaulay had some kind words to say about me. In fact, he referred to me as a superhuman being. Later that day as we were discussing developments in the 'boiler room' a parcel arrived for me. It was a Superman "T"-shirt, a gag from my staff."

Mr. Gomer spent more than 20 days on the stand and devoted about five months o 1974 entirely to the rate review process. S did many of his staff.

"It certainly disrupted family life but somehow the family adjusted. However,

Ask clerk Carol Finney about Hydro's involvement in rate review and she'll point to stacks of books, binders and documents that accumulate during the hearings.



Frank Gomer, general manager—finance, chuckles at T-shirt presented to him by staff after OEB counsel Robert Macaulay described him as "superhuman."

they don't adjust to 4 a.m. arrivals very easily," he said.

He recalled how he had called home one evening to tell his son he'd be delayed until well past midnight. At 4 a.m. when he wandered in, his wife and son were waiting for him in the living room.

Henri Teekman, manager of resource planning in the system planning division; Larry Higgins, economist; and Arthur Hill, generation concepts engineer, were key witnesses at the first phase from January through March. Mr. Teekman recalled that he took up smoking again and was only able to quit in late November.

Grant Bainbridge, director of consumer service, (since appointed Western region manager) spent eight days on the stand as a member of a panel during the final phase of hearings, the actual rate application.

"As far as I was concerned the process was fair," he observed. "We weren't bullied although there were many searching questions and we had to acknowledge that there were areas of rate making which needed more attention.

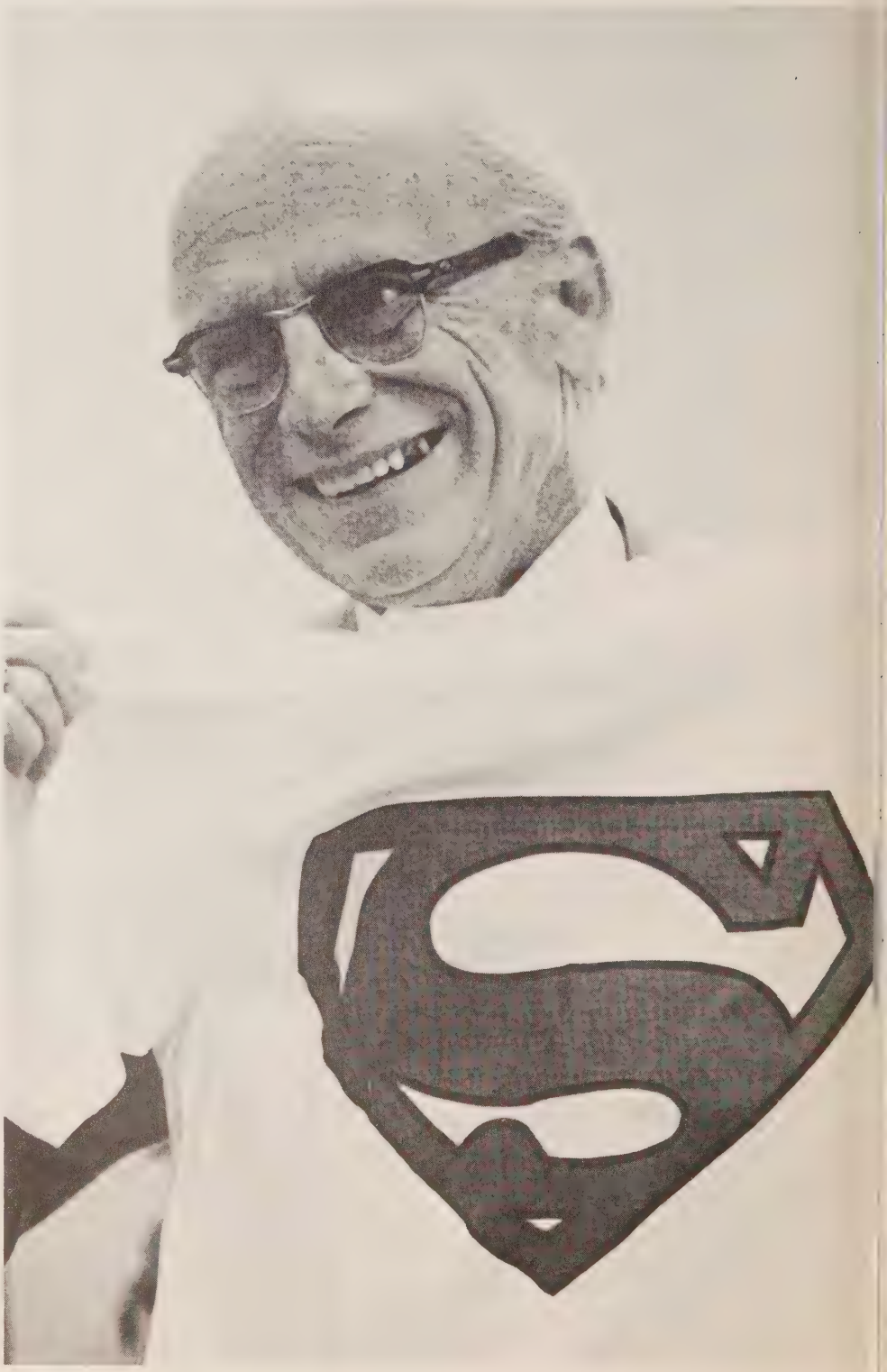
"For instance, we admitted that we had set interruptible rates (special charges to certain industrial customers based on the right of Hydro to interrupt power under emergency situations) on a historic basis, whereas the actual need to interrupt and the acceptance of it has changed.

"Interruptible 'A' power hasn't been turned off for three years. We acknowledged that there is too big a benefit and we volunteered to make a study."

Mr. Bainbridge, like the other Hydro witnesses, feels the hearings should be shortened in the future, "otherwise Hydro will have to hire more staff. I still haven't caught up with the work on my desk," he said.

"It was hard work and frustrating for those who let other work slide, but there was a great deal of satisfaction in a job well done."

Mr. Bainbridge noted that committees were formed last fall, only two months after the 1974 hearings, to begin preparation of the rate application for hearings this year. He anticipates that briefs will be submitted



Mum's the word

o the ministry of energy by April 1, to the)EB two weeks later, with hearings to egin May 15. The committees must liaise with Mr. Burdette who was singled out by nost witnesses for his determination dur- ng the 1974 hearings.

"Ted and his department deserves a lot)f credit", said lawyer Gardner. "It was his eadership in getting the co-operation of he various departments and divisions that nade the process work. Many of these eople did not realize the scope and demands being placed on the organiza- ion.

"I think Ted must have read and edited very word prepared by the various teams nd quite often sent material back because t wasn't good enough."

President Doug Gordon and vice- residents Nastich and H.A. Smith figured rominently in some of the long evening essions.

"It wasn't unusual to see one or all of hem in the 'boiler shop' with us all night ong while lawyer Genest bounced argu- nents and ideas off us, read his notes and simultaneously dictated into his dicta- hone," Mr. Gardner said.

He recalled one instance when Mr. Nastich phoned at about 11 p.m. just to see ow things were going. "The next thing we new he'd driven down from his home and vas with us till dawn."

The night sessions were necessary as witnesses prepared their positions or answered questions that came down each day from the hearings.

"We'd be given an armload of questions rom either the intervenors or the board nd they'd want answers the next day," aid one of the Hydro workers.

How did all this affect family life?

Mr. Gardner put it like this: "For the nost part I think wives and families ccepted that this was an unusual situation or Hydro. In many cases they gave up the ymphony or the theatre and in most cases ad only Saturday night for leisure time. Nobody expected we'd have to go through his sort of detailed hearing and I'm sure veryone involved prays that the next time vill be different." □



Lawyer Pierre Genest with Frank Gomer at hearings.

When someone tells you mum's the word at Hydro, don't take this to mean that everything is hush-hush. It's just a new twist on the old expression which came out of the 98 days of public hearings by the Ontario Energy Board.

It all started back in the early days of the hearings last January when OEB counsel Robert Macaulay asked a witness for a clearer explanation of his testimony. The lawyer said he wanted the evidence to be clear enough that even his mother could understand it.

At first it was just a joke but the statement was made periodically throughout the hearings and was finally shortened to "please explain it to mum!" Evidence was usually modified as a result.

Hydro lawyer Pierre Genest even got into the act and as the bantering between him and Mr. Macaulay continued throughout the hearings, he would often ask his witnesses, "Now please explain this to Mr. Macaulay's Mum."

When it was all over, lawyer Genest got in one final dig during his concluding argument.

"Mr. Macaulay's single greatest contribution to the hearings was 'mum'," he said. "He objected to me calling her a mythical creature, but she does represent an abstraction which has proven extremely useful and which will forever be as entrenched a concept in Hydro as load factors and diversity. She is now in universal use — if I may employ that expression without offence — with Hydro."

"The maxim is that if you cannot explain it to mum, go away and do it again." □

Warming a city's heart

Toronto - sponsored study favors electric heat - conservation systems

by Sheila Kenyon

Electric energy has been cast in the role of fairy godmother in Toronto. An extensive four-year study has recommended use of internal source heat pumps as the most economical and pollution-free method to heat future and present buildings in the inner core of the city.

The District Heating Study, authorized by city council in 1969 under the chairmanship of Ray Bremner, commissioner of Public Works, was released last summer. He calls the study "a firm and positive course of action to solve not only immediate problems but those which are foreseen in the years ahead."

Internal source heat pumps use energy expended in the form of heat within a building from such sources as lights, occupants, machinery and heat-producing equipment. For example, the new Commerce Court complex, which has a daytime population 16,000, uses four heat pumps to reclaim internal heat and redistribute it to areas requiring heating. Supplementary heat is required only when temperatures drop below 10 degrees F (-12C).

Aside from conserving energy, a significant advantage of such space conditioning systems is that electric energy can be derived from water power, fossil fuels, uranium or even refuse.

The city-sponsored study was prompted because of the uncertainty surrounding the future development of Toronto's district steam heating system. In 1962, council thought it had found the answer with the building of Toronto Hydro's Pearl street steam plant. Today its stack is not tall enough to meet air management standards.

But now Toronto has come up with a 20-year plan which will ensure continuing conservation of energy, recycling of waste materials, air pollution abatement, improved building standards, and a city that's esthetically attractive.

The study zeroed in on the need to improve building standards to increase heat conservation. Examination of typical heating and ventilating systems in Toronto buildings suggested that total heat demands could be reduced by as much as one-half if proper attention were given to the engineering of buildings and their heating systems. The study recommends city council pass the necessary legislation.

Representatives from Toronto Hydro, city departments and James F. MacLaren Limited, a firm of consulting engineers, made up the study group. They received input from a wide range of outside agencies and groups.

The group set out to study the cost, air pollution and esthetics of district heating. To do this they studied other forms of heating: boiler plants fired with coal, oil and gas; waste heat from refuse generation, and heat from both thermal and nuclear power plants.

The conclusion was reached that electric heat pump systems have more widespread benefits and future potential for improved air-quality, and city life quality, within acceptable cost limits, than has district heating.

Early in 1975, Torontonians will learn whether their city will be the first city in the world to legislate electric energy as the preferred choice for space conditioning in large downtown buildings. The study calls for "mandatory electric heating with district steam heating optional, where available, for new buildings over 50,000 square feet (4,650 square metres) within the 'inner tracts'."

There are five district heating systems in Toronto supplied by separate steam plants: Toronto Hydro's Pearl and Teraulay Street plants, the Toronto hospital system on University Avenue, the University of Toronto and the Ministry of Government Services systems. The study recommends these systems be interconnected and the Pearl Street plant be discontinued when a new plant is fully operational in the west end of the city. Eventually a District Heating Authority is proposed to operate the system.

While steam will be available to serve old customers and a limited number of new customers, new and old office buildings will be encouraged to use electric heat pump systems. To encourage and facilitate use of heat pumps, the provincial and federal governments will be asked to remove sales taxes. Strategy for heat conservation includes action to limit heat loss from new buildings, control temperature effectively within new and old buildings, and improve efficiency of systems through education of operators and inspection.

A wide variety of other recommendations requires action at the federal and provincial level. Before legislation regarding mandatory electric heat can proceed, ratepayers groups and interested citizens will have an opportunity to present briefs to city council.

Donald Batty of the city's environmental engineering branch says the six-volume study is the most comprehensive ever carried out by Toronto.

As well as advertising for presentation of briefs, the city has invited private firms to take part in the new district steam system. A private consortium has already come up with a proposal to "Put Garbage to Work" by burning 2,000 tons (1,814 megagrams) of refuse per day, or 730,000 tons (662,241 megagrams) per year, to supply both electricity and district steam.

Utilizing waste is not as simple as it appears. Ontario Hydro may eventually burn 200,000 tons (181,436 megagrams) of shredded refuse annually in three of eight boilers at the Lakeview generating station. But a two-year trial project on a 300-megawatt unit will be required to determine whether "Watts from Waste" is feasible. (See May/June issue, Hydro News).

While short-term research may come up with the answers for immediate problems, other groups are looking at new innovative ways to supply heat. Various studies are under way to determine how by-product heat can be conserved, how heat can be produced in combination with electric power and how heat can be derived from nuclear generation of electricity.

Atomic Energy of Canada Limited submitted a report to the heating study on the the possibility of using a nuclear reactor as a heat source for district steam heating. The study concluded that a nuclear plant is not feasible at this time, partly because of the long lead-time required to design and construct such a plant.

Ontario Hydro's report to the study was concerned with the concept of providing



both heat and power. A specific scheme was evaluated and comparisons made between a heating plant delivering 3 million pounds (1,361 megagrams) of steam per hour and a combined plant delivering 110,000 kilowatts of electricity in addition to the same amount of steam. The sizing was intended to supply the base load for a peak demand of 6 million pounds per hour forecast for 1989.

The study found no conclusive arguments for or against combined power and heating systems, and suggested that decisions on this matter can "usefully be suspended until a later time."

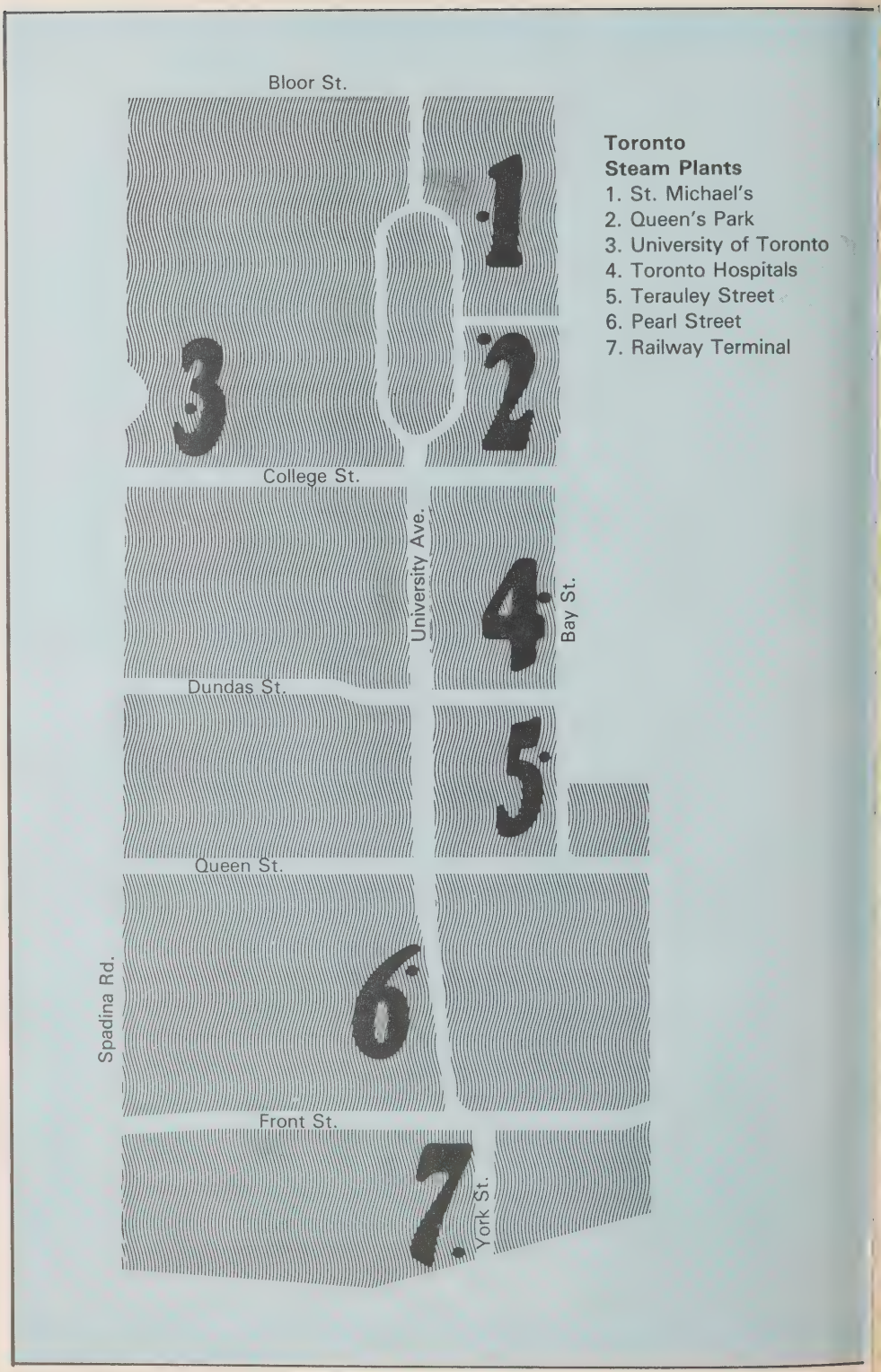
Hydro has on-going studies concerned with the use of heat produced as a by-product of power generation and these may prove of considerable value in the future.

While Canada is in a better position than many other countries, where both electricity and fossil fuels are in short supply, conservation and utilization of by-product heat is important. The British Central Electricity Generating Board, which has frequently discussed how heat from power generation might be used, is now re-examining the whole situation as action to harness waste heat becomes vital.

Converting to use of internal source heat pumps will not put that great a load on Toronto Hydro, either. The study concluded that such systems will be economically competitive in 92 per cent of all buildings over 50,000 square feet and 99 per cent competitive in all new buildings of this size. The peak power demand, which would be imposed on Toronto Hydro if such systems were made mandatory in all new buildings, even by 1989, would be only 16 per cent higher than the currently projected peak.

Internal-source heat pumps are by no means new. Besides Commerce Court, the Toronto Star and Globe and Mail buildings, Harbour Square and the new Ontario Hydro building are among the many large complexes using them.

Since steam is readily available from the University of Toronto, and is more economical than electricity, it will be used to provide hot water for washrooms and restaurants and to melt snow on the outside court of the Hydro building. □



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Vorth the effort

espite the long months of preparation, 12 16-hour days, and seven-day weeks for number of the staff, rate review hearings / the Ontario Energy Board were of net enefit to both Ontario Hydro and the prov-ce, says Milan M. Nastich, Hydro's vice-esident resources.

In a sweeping review of the OEB hear-gs into Hydro's application for a rate crease, Mr. Nastich told delegates to the istrict 1 OMEA annual meeting at Oshawa at from the beginning it was decided that ydro would look upon the review as an pportunity to explain fully to the public nd a board representing the public, the ature of issues facing Hydro in its task of roviding electricity to the people of ntario.

"Fundamental to this approach was the rinciple of complete disclosure both in ubmissions and in response to questions direct and cross-examination," Mr. Nas-ch says.

Mr. Nastich points out that rate review rovides an opportunity for the Hydro staff respond to a challenge and to test them-elves in terms of the effectiveness with hich it has performed its job.

"Ontario Hydro's witnesses performed an outstanding manner and as the hear-gs progressed, I became increasingly roud of the organization and its achieve-ents.

"Rate review also engenders a team pirit in the organization whereby separate nctions such as finance, engineering, perations, supply and the like work gether under strict time pressures on atters of fundamental importance to the rporation," Mr. Nastich says.

And, he adds, rate review encourages a ross-examination process which "I firmly elieve is healthy for any organization."

But, he says, the heavy commitment of enior staff to work on a rate review results other important work being deferred.

Mr. Nastich suggests there is no quanti-tive way to measure the costs or assess the benefits. As a result, various people from differing vantage points can and do come to different conclusions.

As a part of his over-all review, Mr. Nastich says, there is "real danger that Hydro will become so deeply involved in so many OEB hearings that it will find it difficult to function effectively.

"Another possibility is that as rate hearings go on, the major issues will have been clarified and the board will become increasingly involved in scrutiny of relatively unimportant detail.

"But," he adds, "both of these possibilities are a danger both to the energy board and Hydro. In this instance eternal vigilance is the price of effectiveness."

However, he says, he's optimistic about the future because of the dedication of the people who work at Ontario Hydro, the sense of responsibility of the Ontario Energy Board, and the strong support provided by the OMEA.

"Optimism, however, does not mean that any of us can relax our efforts. Energy supply will continue to be a major concern of the people of Ontario for many years in the future. Scrutiny of Ontario Hydro will persist, and it is our task to see that the issues are clearly stated and correct policies adopted to meet them.

"Selling a rate policy means convincing the public of the realism of the issues. This cannot be done by once-a-year efforts. It will require a continuing effort by the municipal utilities as well as Ontario Hydro," Mr. Nastich says.

Waste heat probe

Nuclear power stations could be using more of the heat they produce but generating less electric energy in the future, if a Carleton University study proves successful.

The research project, funded by the Department of Energy, Mines and Resources and the National Research Council, centres around three main subject areas — energy use in transportation, energy use in buildings, and, of most significance to Ontario Hydro, the dual-purpose use of nuclear power plants.

Grants for the project totalled $39,500 for a 12-month period. It's hoped the study can be financed for a further two years. During that time Professor Terry Rogers and five Carleton colleagues hope to learn how to heat homes and run industries with what is now considered waste heat from nuclear reactors.

However, Dr. Rogers says, use of the waste heat given off through cooling water outflows is limited. "At such low temperatures it might be used for aquaculture or in agriculture, but for little else.

"But if we consider nuclear plants as a means of producing both electricity and heat, the heat could be harnessed at a higher pressure and temperature and used in a number of ways for heating and cooling residential and commercial buildings, in industry, or in sewage treatment.

"That way it might be possible to recoup some of the waste energy from nuclear reactors, which in the case of Candu models is about 70 per cent of the total energy produced," Professor Rogers says.

However, such schemes would not be without their problems. Distance is one of the main factors limiting urban main heating systems using hot water or steam. In Sweden and Iceland, 15 to 20-mile-long systems are the longest that have been proven workable.

In Canada, this restriction would mean placing nuclear plants within or close to major population centres, and the accompanying problem of public acceptance.

The best method of transporting the heat, whether by pressurized hot water or by steam, would have to be studied, as would the proper temperature and pressure.

High costs involved in installing such a system, questions of reliability, and the need to reconcile peak heating and electricity demands in a dual-purpose system present further obstacles.

"Careful attention must be given to optimizing the split between the electrical

and heat outputs," Dr. Rogers says.

And he adds: "Of course, whatever we propose, we will have to consider all the environmental aspects."

Environment guide

It's been a long time in coming, but with publication of the Canadian Electrical Association's environmental guidelines in the spring, utilities will have, for the first time, a comprehensive environmental reference manual.

The manual spells out environmental guidelines for use by member utilities in planning, designing, constructing and operating a power system.

It's also designed to assist utilities in the development of policies and practices geared to preserve and protect the environment, while at the same time providing reliable electrical service.

"That's the basic purpose of the guide," says Pat Campbell, Ontario Hydro's general manager — design and construction, who doubles as chairman of the CEA guidelines task force.

"But," he adds, "there are additional — and important — side benefits.

"These guidelines will reflect what utilities are prepared to do in protecting the environment. From that should emerge recognition by government, environmental groups and the general public of the leadership being provided by the CEA and its member utilities.

"A better understanding of the issues involved will help industry, government and the public in dealing with them," Mr. Campbell says.

The manual deals with the need for environmental assessment in planning major system expansion and for effective communication and public involvement in seeking new routes and sites, while retaining the responsibility for decision-making.

Also discussed is the need for research and development in reducing environmental effects and social costs when considering power sales between interconnected utility systems.

General guidelines for all power facilities — from the conceptual stage of design, through the construction period, and during the operating phase — are provided.

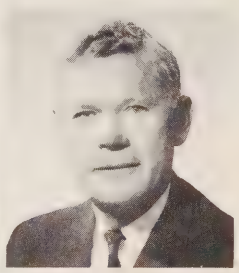
Specific guidelines are also set out for hydro-electric, fossil fuel and nuclear stations, transmission and distribution lines, and sub-stations.

The manual was more than two years in the making.

Divisions joined



Hal Wright



Grant Bainbridge

In a continuing series of reorganization moves, Ontario Hydro has amalgamated the sales and consumer service divisions to recognize recent changes in the nature of the sales operation.

To be known as the customer service division, the new department is headed up by H. K. (Hal) Wright, director of sales since 1971.

E. Grant Bainbridge, former director of consumer service, has been named manager of Hydro's Western region.

He succeeds George R. Currie, recently appointed general manager — regions and marketing.

In other changes Hydro has amalgamated the employee and labor relations divisions and appointed A. D. Allin, former director of employee relations, as director.

E. H. (Ted) Burdette, former manager of the rate review department, has been named comptroller.

Utilities cut back

A growing number of U.S. utilities have cut back or postponed plans to expand their power-making capabilities — a move that analysts say could spell blackouts or even an economic slowdown in the next three to five years.

Based on estimates by the Edison Electric Institute in New York, a non-profit trade association, as well as studies by other utility observers, 40 or more major utilities last year have put off or eliminated more than $10 billion in planned capital spending deemed essential to meeting electrical needs in the next five years.

Many of the proposed projects are nuclear plants, which the industry is hoping will eventually cut its fuel costs. However, nuclear plants cost more to build.

During the first week in August alone, at least seven utilities announced they had either deferred or cancelled a total of $1.5 billion in capital spending slated for the next three to five years.

Virginia Electric and Power Co., which deferred $281 million in capital plans in late July, said it was conceivable the utility could go out of business if its financial base is not more secure.

Many, like Tampa Electric, say they have postponed their plans because, ironically, their customers are heeding the call to conserve electricity, thus cutting down the utility's sales and available funds.

James McCabe, utility analyst for the Wall Street firm of Lehman Brothers, says the "real underlying reason for these spending cutbacks is not lower growth but an inability to finance these projects." U.S. industry earnings declined 15 per cent in the first quarter of 1974, Mr. McCabe estimates, and an additional 1 per cent in the second quarter, even with the help of about $1 billion in rate increases during the first half.

The average residential electric rate, he says, went up 35 per cent in that period.



nong the men who will head up District 1 of e OMEA for the coming year are, back row: A. Bisaillon, Gloucester; S.E. Tripp, Lindsay; L. Andrews, Cobourg; W.M. Morrison, wmanville, past president, and J.D. Collins, rt Hope. Seated, W.O. Murphy, Smiths Falls, cond vice-president; R.H. Hay, Kingston, esident, and J.H. McKinney, Whitby, first vice-esident.

ire scare overplayed

ecent reports that aluminum wiring used thousands of Canadian homes could be fire hazard are exaggerated, says J. A. cker, Ontario Hydro's manager of electri-l inspection.

Mr. Dicker, who headed up a study team look into the reports, says "things aren't arly as bad as they were alleged to be."

He suggests a combination of poor orkmanship and the use of improper wir-g devices on aluminum wire increase the ossibility of electrical failure. The team's vestigation revealed several failures volving aluminium wire, but damage was enerally confined to the outlet box and no ctual fires resulted.

"The number of reported failures is nall in terms of the number of installa-ons," Mr. Dicker says.

The team was set up after news reports ggested that aluminium wiring — which as replaced more costly copper in most ew home circuits — was turning resi-ences into "time bombs" waiting to go up smoke.

ecycling pathway

he Ontario government has put the prov-ce on the path toward garbage recycling th the announcement by Environment nister William Newman of a 15-year pro-am to build primary waste treatment ants in six areas for $17 million.

In the long run — by 1990 or later — pansion of these plants and additions of ners in most communities across the ovince will cost $400 to $500 million in 73 dollars, Mr. Newman says.

However, he adds, this gross cost will reduced by unknown savings from sell-g recovered valuables for recycling and m reduced need for garbage dumps.

At the same time, Mr. Newman nounced plans for an Ontario waste management board.

The new board's main job will be to advise the minister how to cut into the volume of waste and litter "and through packaging and product-design improvement, to facilitate recycling and reclamation."

The Metro Toronto area will get three of the new treatment plants to ease the impact of massive garbage pile-ups in the province's largest population centre. These are designated for Metro itself, Metro-Peel and Peel-Halton.

The other three are to be at London, Sudbury and Kingston. All are cities running short of landfill sites.

Plants will vary in capacity from 200 to 1,000 tons (181.6 to 908 kg) a day — large enough in all but Metro's case to process all their garbage.

Gray steps down

J. Lorne Gray, 61, president of Atomic Energy of Canada Limited since 1958 and one of the key figures behind the growth of Canada's nuclear power technology, has retired.

Dr. Gray has been succeeded by John S. Foster, 53, formerly vice-president in charge of AECL's power program for the past 18 months.

Energy Corporation

The Ontario government plans to spend $100 million to set up the Ontario Energy Corporation, whose prime responsibility will be to ensure the province will have sufficient energy to meet future demands.

In his announcement in the Legislature, Energy Minister Darcy McKeough said the corporation's role will be to "enhance, rather than compete with, private oil, gas or other resource companies in their search for resources throughout Canada or elsewhere."

The corporation will have wide powers to invest in, guarantee and initiate resource exploration and development. This could include financing pipelines, guaranteeing investments by oil or gas companies to further their research and increase supplies — or it could even mean initiating resource projects.

As far as possible, Mr. McKeough says, the corporation will be structured as a normal corporation in the same sense that Air Canada and Ontario Hydro are normal business operations. At all times, however, the government will hold a majority of its shares.

Wind power

British Columbia Hydro has ordered a pair of windmills for experiments aimed at using alternative energy sources.

A spokesman says that the two 2,000-watt units will be located in Clinton, B.C., and in Masset, on the Queen Charlotte Islands, and will be mounted atop 40-foot (12.2 metres) steel towers. They will include a battery storage system and be equipped with instruments to measure wind power potential.

"Windmills would have application in areas where you have substantial wind on a constant basis," the spokesman says.

But, he adds, it's unlikely they would ever be used in the Vancouver area. "You'd have to have the whole city surrounded by them."

Breeder cost up

U.S. atomic energy authorities have increased by more than $1 billion their cost estimate for a key fast-breeder demonstration reactor project.

The increase could have broad implications for government energy policy.

The increase is based on a new calculation that over-all costs of the 350-MW plant, to be built near Oak Ridge, Tenn., will total $1.74 billion by its 1982 completion date.

Two years ago, when the previous official estimate went to Congress, it said the project — then scheduled for 1980 completion — would require only $700 million.

The contrast between the two estimates is heightened by the expectation that inflation-pressed utilities will not be able to increase their contribution to the project beyond the $250 million to which they have already agreed.

municipal briefs

Election night in Trenton held a few anxious moments for the contestants in a race for a seat on the local PUC. And when it was over 16-year veteran commissioner Charles Hilton went down to defeat at the hands of newcomer Barry Box. However, the two were running neck-and-neck until the end when Mr. Box pulled ahead. At times throughout the evening no more than a dozen votes separated the pair.

There's been a lot of talk and opposition of late to Ontario Hydro's plans for generating stations in various parts of the province. But here's a real switch. Up Atikokan way, they're actively campaigning for a planned thermal plant to be built in this northwestern Ontario community. The town's industrial development committee has advertised in the local newspaper in an attempt to have 6,000 letters sent to Premier William Davis and Energy Minister Darcy McKeough supporting its bid for the proposed plant. The ad points out an Ontario Hydro generating station in the community would provide 250 permanent jobs.

Petrolia PUC's chairman, Harry Bain, has died at age 63. Mr. Bain was also chairman of the Petrolia and District Association for Retarded Children.

Napanee PUC's long-time manager, George A. Reid, has retired to live in Moscow, Ontario. Mr. Reid began his career with the utility three months after it was formed in 1930. His first job was as a truck driver.

The Supreme Court of Ontario has ordered Windsor Utilities Commission to restrain from disconnecting electrical service to the city's Trade and Commerce building. The utility and the building owners are involved in a dispute over $11,000.

Sudbury Hydro has offered French classes to its management staff as a first step in encouraging personnel to acquire a working knowledge of Canada's other official language.

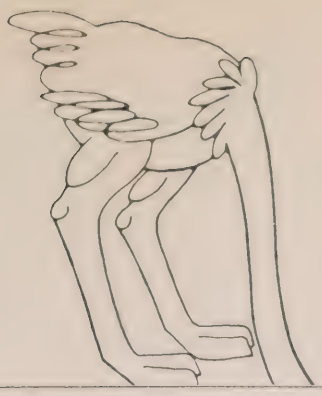
In a continuing town beautification program, Meaford PUC has distributed 200 additional trees free to the townsfolk. Started as a centennial project by the utility to mark Meaford's first 100 years, about 450 trees have been distributed. Most of them are of the sunburst locust species — the tree selected as a centennial symbol to blend in with the community's golden town theme.

Toronto Hydro has increased pensions to 316 former employees who retired from the utility prior to January 1973. The boost has been made retroactive from July 1, 1974.

A gentleman's agreement to provide purchasing assistance to small utilities in the area has been re-affirmed by Sudbury Hydro. The pact provides for assistance to utilities in Coniston, Capreol and Cache Bay. Manager Hugh McKinnon says the need for such assistance is becoming more acute now with the setting of minimum quantities for orders by manufacturers.

It was A. "Tooner" Howard night in Thorold recently when friends and associates in the utility business from across the province turned out to pay tribute to him on his retirement. A familiar figure in utility circles, Mr. Howard was 1955 president of the AMEU.

Norman Fisher, holder of the longest service record in Toronto Hydro's history, has died at age 80. Mr. Fisher joined the utility in 1910 and retired in 1962.



as don wright sees it

s hard to find any comfort in the crummy oney situation but at least one aspect of flation has been good for the ego. Pound r pound and just as we stand, we're all orth a lot more than we used to be.

Dr. Donald Forman of Northwestern niversity estimates that the inorganic omponents of a person weighing 150 ounds are worth a good $5.60 in today's ollars. That's up from $3.50 five years ago nd a paltry 98 cents, fully assembled, in 936.

The good doctor arrived at his figures by diously tabulating the going price for odium, potassium, sulphur, zinc and the any other less-than-exotic elements that gether compose the species homo apiens. It works out at something just over ree-and-a-half cents a pound of body eight—which maybe doesn't do so much r the ego after all. Your friendly butcher ets more than that for his bones.

Snakes and snails and puppy dog tails ould likely fetch a better price, but surely s not the ingredients that count so much s they way they are put together. And the rocess isn't all that unpleasant either.

■ Pardon our pedantry for just a oment, but we can't help wondering how any of our readers share our familiarity ith the latest bit of jargon being tossed out by the energy experts. It's called net nergy, and it might do wonders for your atus if you can make passing reference to ie need for a net energy approach to esources development at the next meeting your petit point group.

In a nutshell, and perhaps that's where belongs, net energy is the amount and ost of energy needed to produce energy. ot too clear? Well, suppose we should ecide to whip up a spot of oil out of shale tar sands. For this we will need a few asic tools such as a billion dollar process- g plant and gargantuan earth-moving achines. Next we total up all the energy equired to make the plant and machinery nd to keep them running. If the BTUs in the l we extract scarcely make up for those we onsumed in the process, then we forget e whole thing and go back to tatting our oilies.

Neat-O, as the kids would say, and the kilowatts per kilowatt method of accounting will be with us for a long time as we move closer to the bottom of the barrel and try to extract the last BTU from our fast-shrinking dollars.

■ Moving on to an equally esoteric subject, we are happy to see that the scientific world is still able to get excited when something really significant comes to pass.

It seems like a long time since that day back in February, 1971, when the word flashed around the world that physicists in California had discovered the rarest and most elusive of all nuclear particles. Dubbed "anti omega-minus baryon" for easy reference, it had a life expectancy even shorter than a chain-smoking, fat alcoholic with a nagging wife. Its lifespan is exactly 15 billionths of a second and that doesn't leave much time for coffee breaks.

But don't start feeling sorry for anti omega-minus. Just two years later came word of the Rho Prime Meson. This poor little particle has to pack a lifetime into one billionth of a billionth of a second.

Inflation is about all it has to worry about, but we are more than a bit uneasy about the latest word from the scientific front. Stanford University has discovered the existence of a completely new kind of particle so outstanding that they're afraid to name it.

"The suddenness of the discovery, coupled with the totally unexpected properties of the particle, are what makes it so exciting," say the physicists.

Kind of puts us in mind of a song popular some years ago called The Thing. And until we know more about this particular particle we'll suggest that they get out of here with that terrible thing before we call the cops.

■ We are continually enthralled by the scope of the Hydro operation and how the ripple effect tends to lap up against so many foreign shores. We were still surprised to learn how the smooth functioning of our vast generating stations could be affected by changing fashions among the Chinese with regard to their underwear.

As we understand it, Hydro has been using seven or eight tons of rags a year for cleaning purposes—much of it discarded underwear salvaged from the Far East. The rags were supplied by firms specializing in their collection, laundering and the removal of buttons, pins and whatever else people may be in the habit of attaching to their underwear.

But the switch from natural to synthetic fibres is now almost world-wide so that rags aren't what they used to be when it comes to soaking up oil, grease and other messes. As a result, Hydro has switched to industrial wipers of a paper-towel type reinforced with a mesh of synthetic fibres.

They work just as well and they are cheaper, but it would be nice to think that Hydro, with all its sophisticated technical pizazz, was still just a little bit dependent on second-hand oriental underwear.

■ What with staggered hours and other liberalized work practices much to the fore these days, we were interested in a note sent to Employee Relations from a lady in the Metro area.

"My sister-in-law comes from California," she says, "where she worked as a teacher. She tells me that in California it is common practice to have a day off every month or so (quite allowable) and simply call your employer and say I'm taking the day off for the hell-of-it."

How nice to know you're not telling a fib or fumbling for an excuse, but so refreshing to honestly say "I'm having a hell-of-it day."

It's a nice thought and management is likely to go along with it—so long as such days are subtracted from regular vacation entitlement. That's the hell of it.

■ Adequate insulation is one of the best ways to conserve energy, according to the experts, and the prospects seem unlimited if a recent technical development is relevant to the situation. A container has been developed for cryogenic purposes, they tell us, which has a rate of heat loss so low that if we were to put a cup of boiling coffee in the thing today it would still be too hot to drink 2000 years from now.

With insulation like that we could keep our pads warm with a cigarette lighter or the heat produced from a wifely buss after 25 years of marriage. □

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March/April, 1975

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Paul Page, Design Direction
Bill Flett, Design

the cover

Owen Sound PUC's safety record of more than a quarter-million accident-free man-hours is the envy of many in the utility business. Pole-top rescue practice helps keep it that way. See story on page 20.

Cover Photo: Gary Smith

hydro news, volume 62, number 2

Published by Ontario Hydro, 620 University Ave., Toronto.

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Printed in Canada.

Measure for measure

t's all very well to be exclusive, but the ;ost of membership in the ounces and ›ound club will eventually become prohibi- ive. That's really why North America is get- ing out.

With almost 95 per cent of the world's ›opulation living in metric countries, or hose in the process of converting, it nakes economic sense for leading trading ıations like Canada and the United States o join the majority. It's a big job, but put- ing it off won't make it go away and most Canadians will be getting their first real aste of the new system before the year is ›ut.

Commencing April 1, the Celsius scale or measuring temperatures is being used exclusively in weather forecasts across the ;ountry. A further jolt will come at the ›eginning of September when all forecasts ›f rain and snow will be given only in milli- netres and centimetres.

We've bitten the bullet and all systems ire go.

Much of the broad organizational ıpproach to metric conversion has already ›een blocked out by the federal govern- nent. Co-ordinated by the Metric Commis- ;ion in Ottawa, the Canadian program is noving out of the investigative phase and nto the planning which is scheduled for ;ompletion by the end of this year. Sched- ıling and implementation are the final ;teps in the changeover which is expected o be substantially completed within six or ;even years.

How much is involved for Ontario Hydro ınd the municipal utilities? Hydro has ınnounced that it fully supports the pro- ırams of the provincial and federal govern- nents and is developing an organization to ;arry out its own metric conversion pro- ıram in co-ordination with the federal and ırovincial efforts. The full impact of con- ersion is difficult to assess at this stage, ıut the program will demand high priority .nd substantial investment of resources ıcluding manpower, materials and money. ;ome of the implications of conversion and Hydro involvement are discussed in the rticle commencing on page 10 of this ;sue.

A plan of action has already been drawn up by Hydro's metric conversion co-ordinator in which standards are recognized as being synonymous with conversion. An estimated 3,000 "in-house" standards have been developed by Hydro over the years and more than 50 people work full time on the standards operation. Use is also made of standards established by over 40 outside agencies. All will be affected to some extent by conversion.

Co-ordination and timing will be the keys to a successful changeover in which costs and disruptions are kept to a minimum. This shapes up as a major challenge considering the size and complexity of the Hydro operation and its inter-relationship with many aspects of the economy. Not only will Hydro be required to co-ordinate its program with government but also with its suppliers which include such industries as electrical manufacturing, steel, construction, plastics and forest products.

The pace of conversion in the United States is another complicating factor. Although that country has not officially committed itself to metric changeover, the National Bureau of Standards has completed a 30-month study of the implications of conversion and U.S. industry is off and running with more than 60 major industrial firms having launched metric conversion programs or about to do so. Canada is well behind most of the larger U.S. industries in the implementation of metric units to the design and manufacturing cycle.

The United States is Canada's leading trading partner and an important source of Hydro supplies so that the conversion programs of the two countries must keep pace with each other if their industrial sectors are to enjoy the mutual advantages of a common language on dimensions during the changeover.

And this is what the change to metric is all about. While the tendency will be to think in terms of expense and inconvenience during the actual conversion process, the benefits in efficiency and economies should more than compensate as the world settles down to a uniform basis of measurement.

Much more is involved in changing to the metric system than converting inch-pound measurements to metric while maintaining the dimensions of a unit or component. Whether it's bolts or milk bottles, notebooks or insulators — each must be designed and manufactured to metric standards. This can't be accomplished overnight and in some instances inch-pound sizes will be with us for a long time to come.

It would be impractical and undesirable to toss out good material and equipment simply because they are non-metric. There must be a long and gradual phase-out of long-life equipment which would be replaced only when its useful life is over.

Also, it would be costly and wasteful to permit an expensive item such as a relay or generator to become useless because replacement parts were not available. This will involve maintenance of double inventories, and determining the number, the variety and the length of time such components should be maintained is another difficult part of an exercise in synchronization, the extent of which is difficult to envision. □

Problems at Pickering

How simple and sophisticated methods were used in solving them

by Bill Settatree

August 10, 1974, started out as a routine day at Hydro's Pickering nuclear station east of Toronto.

But by 10 a.m. there was an inkling that something was amiss.

Ed Laing, a relief shift supervisor, was sitting in his office in the plant bemoaning it was Saturday and if it weren't for having to do vacation relief, he'd be out enjoying the summer sun. His thoughts were suddenly diverted when he received a hurried telephone call from laboratory technician Wayne Boisoneau. "There might be something wrong with reactor 3," Laing was advised.

Boisoneau had just taken a routine sample from the annulus gas system in the reactor but had drawn what appeared to be water instead of the usual gas. It was quickly analyzed and found to be radioactive heavy water.

Something was indeed wrong.

Another sample was ordered — with the same result.

The reactor was just in the process of being restarted after a routine shutdown so Laing ordered the unit cooled immediately and then advised station manager Kevin Keane by telephone.

The decision wasn't an easy one to make because for each hour that a Pickering reactor is out of service the cost is $3,000 — that's the difference between nuclear fuel and burning coal for replacement power.

But as it turned out, it was the only decision that could be made. Initial testing revealed three leaking pressure tubes among the 390 in the reactor. Subsequent tests revealed an additional 14 tubes with similar problems.

The reactor was out of service for the remainder of 1974 and part of 1975 while further tests and investigations were carried out. Detection of the remaining leaking tubes took most of the time and plans had to be made for the safest possible method of repairing them. Since the pressure tubes and other components were radioactive, repair work had to be carefully planned to ensure the workers' exposure to radiation was minimized.

Exposure to radiation is measured in units called rems. Atomic energy control regulations permit a maximum whole body exposure of three rems in any three-month period or a total of five rems in a year.

Detection and repair of the first leaking tube used up 75 rems, the equivalent of the maximum dose for 15 men for a year. Because several different crews were used, including staff from Bruce and Douglas Point stations, together with careful planning and personnel exposure control, no one was exposed to the maximum dose.

While Number 3 reactor was being cooled that August Saturday, officials of Atomic Energy of Canada Limited, designers of the station, were contacted and a meeting called for the following Monday. Meanwhile, crews at the station continued to collect the leaking heavy water and by the time the meeting started had recovered 1600 kilograms. This water has now been upgraded and reused.

None of the water escaped from the reactor area because of built-in safety features. There was consequently no danger either to staff or the general public.

In fact, employees who worked on the leak search and the repair program actually laughed when, two months after the initial discovery, news reports played up the "problems." "My wife even wanted to come into the station and see what we were doing," said welder Mike McEwan.

"Nobody at our house was the least bit concerned," said maintenance man Tom Harper. "My boys worked at Pickering during the summer so they were quite interested in the mechanics of the work and we often talked about it.

"Ask anyone who has worked in a coal-fired station and then a nuclear plant which one he prefers. They'll all tell you that the nuclear plant is much better."

From the outset it was realized that locating the leak or leaks would be no easy matter. More than 1,000 feet of one-inch annulus gas piping would have to be probed inch by inch, much of it in hard-to-get-at places made even more awkward by the presence of radioactivity.

Various methods, ranging from the simple use of balloons as plugs to detect leaks to more sophisticated sounding devices were employed to seek flaws.

The balloon method was the first tried and it detected the first leak. But instead o a dime store balloon the engineers cut the finger off an industrial rubber glove, attached it to a tube and inserted it in the suspected pipes. It was then inflated and positioned at precise locations along the pipe. The idea was that with the balloon acting as a plug, the water would stop flow ing through the leaking holes and spotters would be able to detect the channel which had been leaking.

Technical engineers Bob Taylor and Dennis McQuade spearheaded this aspec of the search, working round the clock on

Plant still sets a world record in production

Pickering generating station produced more electricity in 1974 than any other nuclear plant in the world despite the fact that one of its four units was shut down fo repairs for about five months.

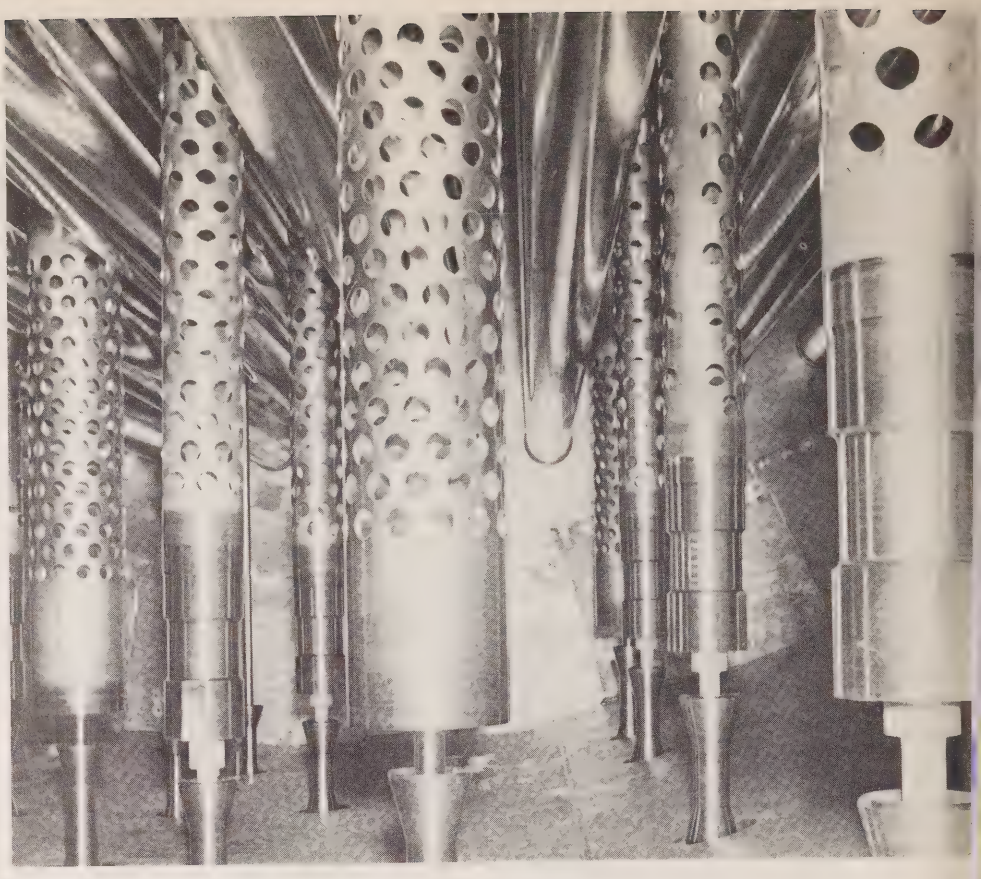
Statistics published in Nucleonics Wee show that Pickering's total production for 1974 was more than 14 million megawatt-hours. This is almost double the production at the Dresden nuclear plant in Illinois, near Chicago, which is of comparab size and compares with about 8 million megawatts at the Quad Cities plant, also i Illinois, near the Iowa border.

Pickering also set a world production record in 1973.

Because of the shutdown of unit three for repairs plus routine maintenance on two others, Pickering still operated at a total capacity of 74.27 per cent for 1974, down from the 83 per cent record it estab lished in 1973.

However, its 1974 performance was fa above the average for the 40 operating nuclear plants south of the border. The U.S. Atomic Energy Commission reporte in December that these plants had operated for the first 11 months of the year at 56.7 per cent of capacity. □

Photo at left shows pressure tubes inside the reactor at the time they were installed several years ago. It was in this area that the leaks occurred. At right workmen are busily making repairs while wearing protective clothing. Lower picture shows worker Mike McEwan examining the mockup prior to entering the work area.



12-hour shifts for several weeks.

"We spent about half the time inside the fuelling machine vault supervising the search," said Taylor. Despite this exposure both he and McQuade received less than one rem.

While the leak locating search was being undertaken, another team of experts came up with a suggestion for speeding up the process. Known as acoustic emission, the method involved the use of sensitive equipment to actually listen to the tubes. Noise fluctuations on the recording equipment would help to pinpoint flaws, it was surmised.

John Graham in Central Nuclear Services and Alan Kupcis of the Research division were instrumental in this aspect of the Pickering detective work.

John Graham recalls that some people were skeptical of the value of the process at first. Involvement was consequently limited initially to confirming what the balloon or sectioning technique had discovered.

On the second search, the balloon method indicated a leak in one particular tube — but when the acoustic emission method was used to verify this, the leak was found to be in the adjacent tube. Acoustic emission was used from that point on.

Here's how it works: A sensor is held or clamped onto the end of a reactor fuel channel end fitting. The sensor detects any acoustic stress waves developing along the fuel channels and converts them to radio frequency electrical signals. These signals are fed to a preamplifier and then to the main amplifier module for analysis.

Only a few seconds were necessary to check each channel in this way.

The time saved reduced radiation exposure by a marked degree and cut search costs considerably.

Some other methods used in the hunt were infra-red photography, television and videotape.

After all the leaking tubes had been discovered it was decided to use ultrasonic testing equipment to inspect other tubes to determine if they had any cracks which could give problems in the future. Ultrasonic inspection differs from acoustic emission in that sound is actually transmitted into the tube material and any discontinuity reflects the sound back to the search unit.

Between August 10, when the first leak occurred, and August 27 when repairs commenced, Hydro engineers, researchers, and AECL officials worked feverishly to assemble the tooling required to cope with the problem. Some equipment and materials were borrowed from the Bruce project and existing tooling was modified. The welding and cutting equipment which would be needed was fitted with long arms in order to reach the working areas.

"We could get at things that would have required a man to have nine-foot arms," said one of the workers.

Engineers tackled the problem of the safe transport of the damaged pressure tubes once they were removed. It was necessary to take them to the Chalk River Nuclear Laboratories for analysis and because of radioactivity they had to be stored in shielded containers for the trip. AECL turned blueprints for pressure tube flasks over to Mulder Engineering in Scarborough and within two weeks, three flasks were built and delivered to Pickering.

The speed amazed officials. Two flasks each weighed five tons and the third weighed 14 tons. One was to handle the tube itself in two nine-foot sections while the other two were for the end fittings.

During that first two-week period, a mockup of the pressure tube assembly wa used by engineers and maintenance men to rehearse for the main event — the actual repair job inside the reactor vault.

Speed and accuracy were essential. Those involved stuck to the philosophy that practice makes perfect, and various approaches were used to cut, weld and replace tubes and end fittings.

The dry runs were watched closely. Motion picture and still photographers were on hand to record each method. A film will be made for use in subsequent nuclear training programs.

Photographers were also sent inside t fuelling machine vault when actual repai on the first tube began so an accurate ru ning account could be kept.

Maintenance men Mike McEwan, Tom Harper and Ross Robinson were selecte to remove the first leaking tube.

That was on August 26.

The job took until September 1 when the new tube was reconnected to the he transport system and pressure raised on again. Additional leaking was noted. This varied with the pressure in the heat trans port system.

Meanwhile the first tube has been shipped to Chalk River and deposited in under-water storage facility. There, engi neers using sophisticated telescopic cal era and ultrasonic equipment detected cracks near the rolled joint. A rolled or mechanical joint is used to connect the pressure tubes to the end fittings on the reactor face.

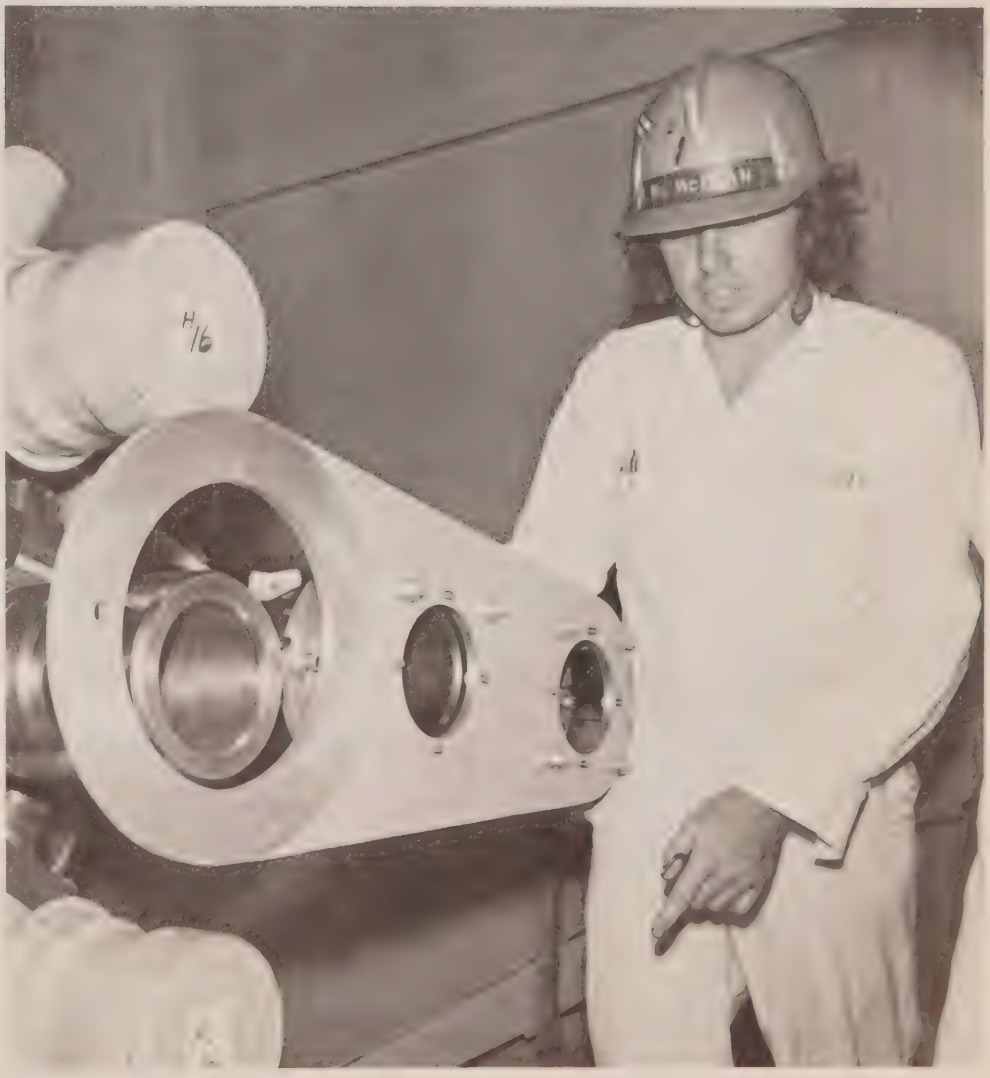


Measurements showed that the joint ad been improperly made: the rollers of he rolling tools had been inserted a frac- on of an inch too far into the pressure ube resulting in high residual stresses in he pressure tubes. These stresses were onsidered to be the main contributing fac- ors to the leaks. It was decided to use dif- erent rolling tools and modified rocedures for the replacement tubes. The econd channel was replaced without inci- ent during September.

The third tube presented a snag when a uide trough jammed. Additional tooling ad to be developed to remove the tube ith the jammed trough assembly. That ook two days. By October 4 the third new ressure tube had been installed and test- g for further leaks continued.

By the week of October 7, investigations onfirmed additional leaks did exist in a umber of tubes. It was obvious at that oint the unit would be shut down for many eeks and that more detailed preparations ould have to be made for the repair pro- am. Gerald Towgood was appointed to o-ordinate the entire unit 3 investigation nd repair program while Ian Dewar was eparing and organizing the detailed day day procedures for the work to be done the station.

Since it was obvious that several tubes ould have to be replaced, arrangements ere made to construct a special storage ea in the basement of the station well way from traffic areas. Thick concrete alls provided the shielding required.



New equipment designed to avert problems at Bruce

Additional transport flasks were also ordered and delivered to the site. This was co-ordinated by Mike Nichols of Central Nuclear Services and Tom Drolet of generation projects.

Canadian General Electric's Peterborough plant was given a contract to design and build a shielding cabinet made of two-inch-thick steel plate from which crews could work while completely protected from radiation. "With this new equipment they could stay in the vault all day," Mr. Towgood said.

By this time researchers had improved on the original ultrasonic testing device which had been built by AECL at Chalk River. The new device, attached to the end of a fuelling machine, did not require the removal of fuel from the pressure tubes to be tested — a major plus factor in economy and time.

Engineers had also deduced that the leaking problem likely occurred during long shutdowns when the tubes were cold and pressurized. Operating procedures for Hydro's nuclear plants were then modified to minimize the duration of these conditions in future.

The leak search with acoustic emission equipment and the subsequent hunt for cracked tubes that could become leakers continued until January 6. The final result was the detection of 14 leaking tubes besides the three originally found.

In January, crews began working inside the fuelling machine vault to remove those leaking tubes and the accompanying hardware. Under the advice of health physicist Chris Bieber and monitoring by radiation control technician Pat Dineen, the radiation dose exposure to the workers was carefully controlled, despite significant radiation fields during some phases of the job. Final repairs to unit 3 were completed by late March and the reactor returned to service. □

One day in late January a truck backed up to the loading platform at Hydro's Bruce generating station on Lake Huron.

Crews unloaded what to the casual observer might appear to be some sort of gadgetry from a science fiction movie.

But this wasn't fiction — it was fact, and the equipment was the first of several shipments which marked the culmination of three months dogged determination on the part of a special task force searching for a method to reduce residual stresses on pressure tubes already installed at the Bruce station. They wanted to avoid leaks like those which forced one unit at the Pickering plant out of service last fall.

The equipment, worth about a quarter of a million dollars, had been designed and built in less than two months. It was another example of the co-operation and expertise which went into the solving of the leak problem in a timespan so short that it has captured the interest of nuclear scientists from around the world.

Each of the 10 pieces of apparatus contained a control panel with measuring and monitoring equipment, an eight-foot-long unit in which were inserted 20 electric heaters, sealing gas rings, and a cooling section. This was the equipment which would save millions of dollars in lost time and generation had it been necessary to replace the tubes in existing Bruce reactors — a task that could have taken a year or more. Although the delays were costly, the total time loss in Bruce construction would be limited only to a few months.

One of Hydro's men on the task force was Art Jackman. He worked with John Ingolsfrud of Atomic Energy of Canada Limited. Officials of Canadian General Electric, Westinghouse Canada and Orenda as well as various AECL laboratories were also involved in the task.

Data from an analysis of the leaking Pickering tubes proved that added stresses had resulted because installation tools had moved a fraction of an inch too far into the reactor. This caused residual stresses of 60,000 pounds per square inch instead of 20,000 which was normal. When the unit was shut down for maintenance, the high stresses resulted in a build up of zirconium hydride (tiny flakes in the metal) in the high stress sections causing them to crack. The new tooling devised for replacing the Pickering tubes will resolve this problem in future. This same tooling is to be used on tubes yet to be installed in other Bruce reactors.

But the task force decided after detailed studies that the present Bruce tubes could be saved if stress relief could be accomplished before startup.

Various methods were explored ranging from induction heating and resistance heating to a process involving a laser beam and a series of mirrors. The laser could be aimed into the tube and bounced from mirrors to the spots affected. This method was advanced by a company in Boston but was ruled out as unsatisfactory.

Electric resistance heaters developed by AECL engineer M. S. El Nesr were finally selected. An advanced version was then designed and built by Westinghouse Canada Ltd. at Hamilton. Art Jackman said the speed with which developments occurred in the entire Pickering-Bruce problem was nothing short of amazing.

"At one point everyone thought we'd be facing a shutdown period at Pickering of up to two years. We knew we couldn't afford to wait that long so pulled out all the stops. Persistence certainly paid off."

Although nobody has given an actual cost figure, the total repair work is expected to run into the millions of dollars. But this is small when weighed against the $3,000 an hour loss in generation from a shutdown unit.

At one point Canadian General Electric at Peterborough had 50 men working on dummy fuel bundles for the leak research. Westinghouse and Orenda were also involved with large task groups. Top scientists at AECL dropped everything they were doing to tackle the problem. So did some Hydro researchers.

And, if all goes well, by early next year the first unit at the Bruce nuclear plant will likely be churning out electricity. □

The public has its say

All who show interest can take part in shaping Hydro's future planning

by Bob Morrow

This year everyone who wants the opportunity — and has signified interest — will have a "say" in shaping the growth of Ontario's power system for the decade following 1982.

As an indicator, more than 650 persons replied to an ad placed in 39 Ontario daily newspapers last November 12 asking for copies of Ontario Hydro's long-range planning report. Many also sent letters to express their concerns.

The issues will be thoroughly explored at public hearings designed to provide broad public participation in the planning process.

The long-range planning report discusses the factors which must be taken into account in the long-range planning process, the constraints which must be observed, and the options and trade-offs available. It presents several alternative plans for the period up to 1993.

The long-range report was initially submitted to the Ontario Government early in 1974. Subsequently, former Energy Minister Darcy McKeough said the government would submit the report for public hearings and review in terms of environmental effects, socio-economic factors, financing, load growth, system reliability, interconnections between utility systems and power pooling arrangements, and other considerations.

Copies of the long-range planning report were first sent to individuals, municipal councils, citizen groups and organizations which Hydro believed would be interested. In addition, the November 12 ad made the report available to anyone who requested it. As a result, more than 15,000 copies of the report have been distributed throughout the province.

In a wider approach to public participation, Hydro has taken these steps to encourage public comment on the long-range planning concepts and is collecting suggestions, recommendations and proposed changes.

All comments received up to one month before the public hearings begin will be submitted to the hearing agency. Hearings are scheduled to start this spring, and Mr. McKeough predicted they will take two years or more.

The hearings, to be held before an independent commission, are a sequel to an eight-month public review of Hydro's pre-1982 expansion plans, financing and its application for 1975 rate increases conducted in 1974 by the Ontario Energy Board. Hearings into Hydro's application for 1976 rate increases will also be held this year.

As a result of the 1974 hearings, the government approved the doubling of Pickering nuclear power station, construction of an oil-fired plant at Wesleyville near Port Hope, and two additional heavy water plants at the Bruce Nuclear Power Development.

However, Hydro proposals to build Bruce generating station "B", a new station to be called Darlington generating station, near Bowmanville, and a fourth heavy water plant were deferred for further consideration.

Future growth rate a big question mark

Hydro's long-term growth rate, dating back to the early 1920s, has been 7 per cent per year. Up to now Hydro planning has been based on an expected continuation of this historic pattern.

However, if customers switch to electricity to avoid use of scarce fossil fuels or to reduce their contribution to air pollution, a higher growth rate will result. On the other hand, increases in rates and more emphasis on pollution will produce a lower growth rate.

It is not possible to predict which effect will predominate. If the two effects balance out, growth will continue at 7 per cent.

The report is based on continuation of the 7 per cent rate, but to illustrate the effect of a lower or a higher rate it presents programs on rates arbitrarily set at 4 per cent and 10 per cent.

Chairman Robert B. Taylor has indicated that planning and control of growth will be among Hydro's key concerns in the future, while in a recent speech president Douglas J. Gordon underlined the tentative nature of the long-range planning report.

Says the report: "The long-range plan developed by an electric utility is different from a long-range plan for land use or regional development issued by the government.

"The government plan is a statement of intent, with the implication that it will be backed up by legislation which will ensure that the plan comes to fruition.

"A utility plan, on the other hand, is only a statement of what might happen in the future if certain other things, over which the utility has no control, come to pass.

"The utility can only say that if the load growth is in a certain range, and if certain technological and social changes take place, it is most likely that a future power supply system of the type shown in the plan will be adequate for the supply of electric power in the area."

The report provides a 20-year framework within which to evaluate Hydro's short-range plans, says Mr. Gordon, and gives the government and the public an opportunity to see the general direction in which Hydro must proceed, based on current social values, needs and goals "as we perceive them."

"If someone says we don't perceive them accurately, or we really are blind to them altogether, then this report gives them the opportunity to tell us so and correct our assumptions," said Mr. Gordon.

"If, for example, the government decides that social and economic goals can be achieved by a 4 per cent annual growth rate in power demand, and it is prepared to take whatever steps are necessary to enforce that growth rate, fine. We will follow that guideline in our expansion plans.

Mr. Taylor said in a recent interview that Hydro will be able to cut back on its construction program in the 1980s only to the extent that its customers give solid indication that all have firmly grasped the conservation ethic.

"We have to become savers as well as users," he said.

Immediate need seen for several new sites

Hydro has drawn up alternative generating programs to meet possible growth in demands until 1993 in Southern and Northeastern Ontario. Various numbers of new sites will be required, ranging from two sites for 4 per cent annual growth to 14 for 10 per cent annual growth.

Hydro believes 7 per cent growth rate should be used for future planning. At this rate only two new sites would be required if these sites and several existing sites could be developed into energy centres of eight to 12 large generators in continuous construction programs.

However, to allow time for the environmental effects of large plants to be assessed thoroughly it is more realistic to assume that these plants would be built in four-unit stages, with 10-year intervals between stages (three years to assess environmental effects and seven years to build the ensuing stage). In this case nine new sites would be required to accommodate the number of generators required by 1993 at 7 per cent growth rate. This would increase to 11 if it were decided that only one four-unit plant would be built on each site.

Northwestern Ontario's requirements are relatively small, but a new site for a thermal generating station is needed immediately. Plans for the future also envisage expansion of the existing coal-fired Thunder Bay station, possible extension of firm power purchases from Manitoba, and ultimate development of large nuclear stations.

Thus Hydro foresees "an immediate need" to purchase several large sites on the shores of the Great Lakes east, west and north of the Toronto-Hamilton-Niagara area.

At present, 45 per cent of power demands originate in the Oshawa-Toronto-Hamilton-Niagara area, and 40 per cent in the rest of southern Ontario.

Underground transmission proposed in some areas

New transmission lines will be mainly 500 kV in future with connecting circuits of lower voltage to supply consumers. The amount of transmission will depend partly on the location of generating stations in relation to centres of power demand.

It is assumed that most 230 kV and 500 kV lines will be overhead until 1993, but the long-range planning report says the highest priority for underground should be given in central business districts of cities and towns and in developed residential areas.

The next priority for underground transmission should be in areas involving parks, institutions, light industrial and commercial zones, or those having already cluttered transmission or station facilities. However, the report says improved appearance overhead structures should be first considered in these areas.

There is an option in some urban and suburban areas of replacing existing installations with 500 kV overhead and 230 kV underground lines. Such rebuilding would be costly, but would have the advantage of using existing rights-of-way for new 500 kV circuits.

New designs are proposed for transformer stations along with landscaping to blend with the environment.

Long lead times needed to meet power demands

The report explains that final planning decisions must be made on new projects five to 12 years before in-service dates.

Because of such long lead times, a delay in authorizing new construction will have no immediate effect on reliability of electrical supply, but it will reduce realiability several years in the future. Once deterioration occurs, several years would be required to build new facilities to correct the situation.

"Ontario Hydro's objective has been to supply all electrical demands safely, reliably, within environmental standards, and at the lowest feasible cost consistent with financial stability," says the report.

But a system of trade-offs will be necessary to strike a balance between increasing capital spending to meet rapid load growth and rising environmental standards, accepting lower environmental standards to conserve capital, or reducing reliability or curtailing load growth to meet environmental standards within limited capital requirements.

What about possible new sources of power?

Hydro assumes most new generating capacity until 1993 will be nuclear supplemented by fossil-fuelled stations. Unit size will range upward from 750 megawatts, th size used at Bruce generating station.

Fuel cells or solar power cells, still in th developmental stage, are not expected to provide enough generation within 20 year to affect the plan, but this generation can be accommodated if it becomes available

Relatively small amounts of firm power are expected to be imported. It is unlikely they will have a substantial effect on the amount and timing of major additions to generating capacity in the province.

Upper Huron site meetings planned

The first step in Ontario Hydro's public pa ticipation process, ultimately leading to selection of a site for a generating statior on the North Channel of Lake Huron and routes for associated transmission lines, now under way.

Hydro representatives plan meetings with municipal officials in the study area the generating station site (roughly between Bruce Mines on the west and Ki larney on the east) to outline the process and the criteria for selecting the site and transmission line routes.

Later, the general public will be involv through open meetings and discussions with special interest groups. Key Hydro concerns will be environmental impact, broad public understanding of the neces sity of the project and technical feasibilit

Hydro is looking for a shoreline site o between 2,000 and 3,500 acres suitable a large generating station (to begin prod ucing electricity in about 10 years) and a heavy water production plant. □.



A big sniff helps clear the air

A "super sniffer" is Ontario Hydro's newest weapon in the fight to help save money, conserve fuel and reduce pollution.

It's a flue gas analysis system that can analyze five gases from one of eight sample streams taken from the boiler of a fossil-fired generating station. And it analyzes them simultaneously.

The equipment gives a continuous flow of data which permits plant operators to fine-tune boiler operations. The result is improved combustion efficiency, which means fuel savings, and stricter control of gas emissions.

Scrutiny of combustion gases has become increasingly important because of rising fuel costs, environmental restrictions, frequent startup and shutdown of units to meet fluctuating power demands, and use of a variety of fuels.

Continuous analysis permits operators to maintain the optimum ratio of fuel and air flows. If the ratio is too high, heating losses occur due to unburned carbon. If too low, overall efficiency and energy release drops.

The "sniffer" analyzes the levels of oxygen, sulphur dioxide, carbon monoxide, carbon dioxide and nitrogen oxides in the boiler's economizer section. It has been used to sample gases at the Hearn, Lakeview, Lambton and Nanticoke stations, and has helped in evaluating future use of Western Canadian coal.

This year the equipment will be used in setting up combustion controls at Lennox, Hydro's first oil-fired station near Kingston. Control of oxygen levels will be crucially important at Lennox, where a low excess air technique will be used to inhibit formation of nitric oxide and sulphur trioxide which could damage boilers and cause unwanted pollution.

The equipment was designed jointly by the Central Thermal Services (CTS) and Generation Projects under the guidance of technical supervisor Mike Booth. It evolved from a prototype built by the Research division several years ago which was modified and placed in service last May.

Central Thermal Services co-ordinates programs designed to ensure Hydro's fossil-fuelled stations meet divisional objectives for safety, reliability, environmental protection and economics.

The "sniffer" has two parts — a sampler and an analyzer — and detects two or three parts per million of some gases. Through a series of stainless steel tubes, the sampler continually draws off eight samples of gas from a horizontal cross-section of the boiler, cleans and dries them, then pumps each to the analyzer at an average interval of two-and-a-half minutes. In this way, the characteristics and distribution of the gases can be determined.

The equipment has shown the possibility of significantly reducing the carbon content of fly ash formed when coal burns at Lakeview and Lambton stations. This carbon, captured along with ash particles by electrostatic precipitators to prevent pollution, not only represented loss of heating value but posed a problem: the level had to be reduced by other methods before fly ash could be used in making concrete.

This lower carbon ash would be expected to be more suitable for recycling into lightweight aggregate at the Lakeview fly ash plant for the concrete products industry. Processed fly ash can also be used to replace up to 30 per cent of the cement used in making concrete.

Don Gillies, superintendent of the environmental section of CTS, cited a U.S. study which indicated that reducing the level of carbon monoxide in combustion gases on a single generating unit of the U.S. plant would save nearly $35,000 a year in fuel oil.

"In addition", he suggested, "if we could reduce carbon losses by half at all coal-fired plants, sizeable savings in fuel costs would result."

The gas analysis technique looks so promising that Hydro is building a second sampler to provide 16 probes to investigate the distribution of combustion products in more detail. □

Metric conversion

Everyone's involved

by Bob Morrow

Farewell Fahrenheit? That day will come.

Canada got its feet wet in metric conversion by swinging over to the Celsius temperature scale for weather reports on April 1.

But even as the federal Atmospheric and Environmental Services department goes metric it's expected to take several years before everyone abandons Fahrenheit. Another metric step is planned September 1 when rainfall will be given in millimetres and snowfall in centimetres.

Official use of Celsius, however, is a significant start on a lengthy process: A tidal wave of far-reaching change in weights and measures will wash across the country in the next decade.

Ottawa expects gasoline to be sold in litres this year and highway signs across Canada to be converted to kilometres in September, 1977. Speed limits on highways will be expressed in kilometres per hour.

But, even more significant as a harbinger of change, the construction industry — a pace setter in metric conversion — is close to establishing an "M" date after which all construction will be in metric terms.

Back in 1970, when Canada decided to organize conversion to the Système International d'Unités—the International system of Units — metric conversion seemed like a cloud no bigger than a man's hand.

Now, with speed that will surprise the unwary, we will have to bite the bullet: learning how to cope with metric terms and their implications. Everyone in the country will be affected.

The federal government set up a Metric Commission in 1971 which established 11 steering committees and 60 sector committees representing all sectors of the Canadian economy. A timetable beginning in 1974 and ending in 1979 was established, but the process of working pounds and inches out of our system will likely take much longer. Ottawa hopes to substantially complete implementation by 1980.

It's not just a matter of converting inches into centimetres and pounds into kilograms. SI will involve new sizes for many things. Having to express sizes in different units provides a once-in-a-lifetime opportunity or perhaps the only opportunity industry will ever have to reduce the proliferation of sizes which have grown up around the present system of measurement. This rationalization will reduce production and inventory sizes.

If a sudden change occurred, you couldn't find a bolt to fit your car. That's unlikely to happen if planning, scheduling and implementation mesh properly with the introduction of metric sizes. The overriding problem is co-ordination to keep everyone informed and in step.

Metric conversion will have important implications for Ontario Hydro, which has about 23,500 employees, and the 350 associated municipal utilities, and several thousand suppliers. At present the ramifications are being investigated in detail so that co-ordinated action can be taken to minimize costs and to obtain the maximum benefits of metrication.

Ontario Hydro will incur costs for planning, co-ordination and changing its documentation as well as for hardware. But, the consensus in business and governments is that ultimate benefits will exceed the costs of conversion and that costs can be considerably reduced by careful planning.

For example, inventory control will get lots of attention. Ontario Hydro's warehouse facilities stock about 10,000 items of every description. In some instances, customary-size stocks can be reduced to coincide with the introduction of metric items, but in others, two sets of sizes will have to be carried for an indefinite period of time. Eventually, the payoff will come when, say, fewer varieties of tower bolts and nuts will be stocked because sizes are rationalized.

The Canadian Standards Association estimates that automotive and other large manufacturers could achieve millions of dollars in savings by rationalizing the sizes of metric fasteners.

Hydro has set up a standards and metric conversion department headed by manager William Olinoski, who has drawn up a "proposed plan and approach" for the corporation. A metric steering committee, chaired by Mr. Olinoski, has been established which includes 18 representatives from various Hydro branches and divisions.

The Association of Municipal Electrical Utilities, which recommends technical guidelines for PUCs, is represented on the Hydro steering committee. The municipal utilities have indicated they will endeavor to move in step with Ontario Hydro.

On the national scene, Ontario Hydro is part of the electric power economic sector covering major electric utility systems across Canada, most of which already belong to the Canadian Electrical Association. These systems have formed a committee for metric conversion headed by J.M. Vanderleck of Hydro's research division. Mr. Olinoski, a member of this committee, also represents the CEA on another sector committee and has lines of liaison set up with others.

This interconnecting network illustrates the complexity of metric conversion and efforts to co-ordinate the changeover throughout the electrical industry. In each economic sector the national committee is drawing up a timetable for various phases of metrication.

Even before the federal commitment to SI, Ontario Hydro had moved into the metric world. Such metric terms as kilowatt, ampere, volt and hertz have long been in everyday utility use. Other international units have also been widely used among researchers, chemists and other specialists, sometimes with unwieldy conversions which will no longer be necessary.

As well, Hydro nuclear operations adopted SI several years ago, extending from its Nuclear Training Centre at Rolphton through power stations and reaching out to suppliers of equipment and service. All instrumentation is already metric at Bruce A generating station, Bruce heavy water plant A and the oil-fired auxiliary steam plant.

Metric conversion, however, eventually will have its largest impact on design and construction of new stations and transmission lines.

To gain experience, initial designs for

continued on page

Photo: Ron Brown





Basic building blocks

The SI (Système International) metric system, which had its origins in 18th century France, is simpler and more convenient than the inch-pound system.

It uses multiples and sub-multiples of 10 with the standard international units such as the metre, gram and second. SI units have universal applications which span national and professional boundaries to improve communications.

The seven basic SI building blocks are units for length, mass, time, and temperature, the ampere for electric current, the candela for light intensity, and the mole for the amount of substance.

Two supplementary units, the radian and steradian are used to measure angles. Using these basic building blocks all other units of measurement can be constructed.

At one time the metre was defined as a particular fraction of the earth's dimension between Dunkirk and Barcelona. But since 1960 it has been defined in terms of a particular wavelength of radiation from a hot cathode discharge lamp containing krypton 86.

The evolution of the metre illustrates th trend toward precise, reproducible measurements. The unit of time, the second, and of temperature, the kelvin (equivalent to the "degree Celsius" although the zero points of the two scales differ), have also been defined in terms of constants found in nature.

For example, the second is based on the resonant frequency of the caesium-13 atom and the kelvin in terms of the tempe ature at the triple point of water which is the point where its solid, liquid and vapor phases exist together in equilibrium. This point is established as 273.15 kelvin or zero degrees Celsius.

However, the kilogram can't be found nature. It's based on the mass of Prototyp Kilogram No. 1 at the International Burea of Weights and Measures at Servres, France.

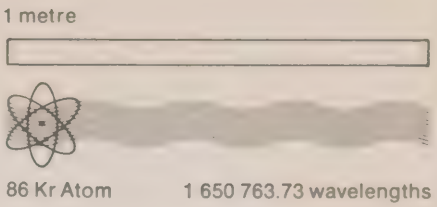
But among scientists there's no urgen to produce another standard. Copies of t prototype are accurate to one part in 100 million. □

metre
m

length

The metre is defined as 1 650 763.73 wavelengths in vacuum of the orange-red line of the spectrum of krypton-86.

The SI unit of area is the square metre (m^2).
The SI unit of volume is the cubic metre (m^3).
The litre (0.001 cubic metre), although not an SI unit, is commonly used to measure fluid volume.



kilogram
kg

mass

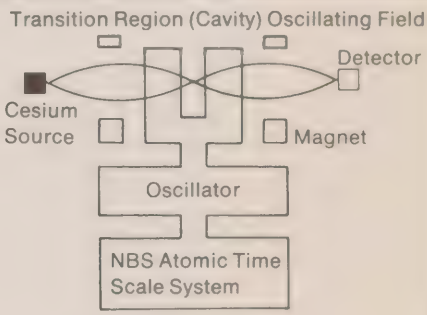
The standard for the unit of mass, the kilogram, is a cylinder of platinum-iridium alloy kept by the International Bureau of Weights and Measures at Paris. A duplicate in the custody of the National Bureau of Standards serves as the mass standard for the United States. This is the only base unit still defined by an artifact.
The SI unit of force is the newton (N). One newton is the force which, when applied to a 1 kilogram mass, will give the kilogram mass an acceleration of 1 (metre per second) per second.



second
s

time

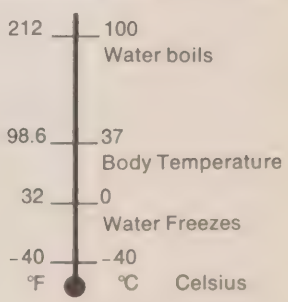
The second is defined as the duration of 9 192 631 770 cycles of the radiation associated with a specified transition of the cesium-133 atom. It is realized by tuning an oscillator to the resonance frequency of cesium-133 atoms as they pass through a system of magnets and a resonant cavity into a detector.
Schematic diagram of an atomic beam spectrometer or "clock". Only those atoms whose magnetic moments are "lipped" in the transition region reach the detector. ▷



kelvin
K

temperature

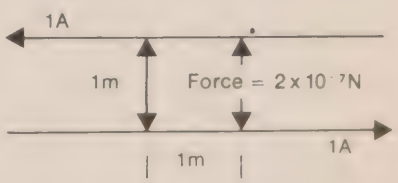
The kelvin is defined as the fraction 1/273.16 of the thermodynamic temperature of the triple point of water. The temperature 0 K is called "absolute zero".
On the commonly used Celsius temperature scale, water freezes at about 0°C and boils at about 100°C. The °C is defined as an interval of 1 K, and the Celsius temperature 0°C is defined as 273.15K.
1.8 Fahrenheit degrees are equal to 1.0°C or 1.0K; the Fahrenheit scale uses 32°F as a temperature corresponding to 0°C.



ampere
A

electric current

The ampere is defined as that current which, if maintained in each of two long parallel wires separated by one metre in vacuum, would produce a force between the two wires (due to their magnetic fields) of 2×10^{-7} newton for each metre of length.
The SI unit of voltage is the volt (V).
The SI unit of electric resistance is the ohm (Ω).





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the proposed Toronto Central transformer station on McCaul street were scaled in both feet and metres although the station will be built with inch system measurements.

Proposed expansions of Pickering and Bruce stations will be essentially duplicates of existing designs, barring extensive use of SI. But serious consideration is being given to designing and building a completely metric nuclear station in the 1980s. Metric-size steel girders and fasteners are expected to be available as early as this year.

Plans are under way to eventually convert instrumentation of all nuclear and fossil-fuelled stations to SI, while computing services are assessing the need to convert computer programs into metric terms.

Research division, of course, already leads in SI. "We can convert our reports tomorrow if people want us to," said Mr. Vanderleck.

Staff training will play an important part in the Hydro conversion process. This spring a series of seminars is planned for various levels of management and planning is under way to familiarize a broad range of employees with the metric system.

Posters have been displayed on bulletin boards and metric fact cards were recently distributed to all staff members to help them think metric.

As a booklet prepared by the Metric Commission advises Canadians: "The sooner we begin to think metric the sooner we'll all feel at home with the metric system." □

Getting in step with the world

No longer will Canada and the U.S. be an isolated inch-pound island in a metric sea.

Canada took a cautious lead several years ago with a wary eye on the U.S. — its major trading partner — but in some areas the U.S. is now believed to be ahead.

Last May the U.S. Congress defeated a metric bill on technical grounds but not on principle. A new bill is being introduced to appoint a U.S. Metrication Board and get on with a nation-wide conversion program.

Meanwhile, about 60 major U.S. industrial firms have embarked on metric conversion or have announced such policy. Companies like General Motors, Ford, Chrysler, Uniroyal, IBM, Westinghouse and General Electric are in the process of planning their metric organizations both in the United States and Canada.

Indicating the importance of trade across the border, Ontario exports to the U.S. in 1963 totalled $8.9 billion, compared with $1.25 billion to metric countries and $730 million with others.

Both Canada and the U.S. are major trading nations and today more than 95 per cent of the world is metric or converting to SI. □

Split-second timing gets Nanticoke going

Ask Berke Scarrow, station manager at Ontario Hydro's Nanticoke generating station, what's impossible and he's likely to say "nothing."

Almost everyone thought it was impossible to restore three 500-mW units to service the weekend before Christmas — in time to meet expected winter peak demands — when the last of the essential components didn't arrive from Britian until December 17.

The big machines were restored to service by the plant's entire corps of mechanical main`ainers and their helpers working round the clock in two 12-hour shifts for five days to keep ahead of the pressing deadlines.

Nanticoke's output was lost to Hydro's system in July when an explosion and fire in a fourth unit forced a shutdown until cause of the mishap could be determined.

The fire-damaged unit (the tab is expected to be in the millions) won't be available until late this year.

Exhaustive investigations by teams of Hydro personnel and C.A. Parsons Ltd., the British manufacturer of the unit, revealed that a design fault in the generator rotor end rings was the culprit.

Mr. Scarrow says when the cause was pinned down, end rings in all units in service were removed, modified and reinstalled.

(The rotor is like a long steel axle, linked at one end to a steam turbine fed by coal-ired boilers. Parts of the rotor are wound with heavy copper wire, which are electrified to make the rotor a strong electromagnet.

(As the rotor spins at 3600 rpm, it induces a 60-hz, 500-MW current in surrounding stationary coils. Power is then fed through large transformers into the provincial grid.

(An end ring is a hoop of milled steel used to keep the soft copper wires from stretching away from the rotor because of the speed of the spin.

(One of these rings, 3-3/4 inches thick, 30 inches long, and 43 inches outside diameter, cracked, grinding against the stationary parts of the generator until the heat ignited insulation around the copper wires.)

"It was a highly-organized project, and we set a tight target date for the rings reinstallation. Every supervisor was given a detailed critical path schedule on which the timing of every step and movement was marked. Each second was accounted for — the operation was planned to the nth degree," Mr. Scarrow says.

He adds the Nanticoke crews were ready to implement the program November 25, but Parsons experienced labor problems at its plant in Newcastle, England, and the first of the modified parts was not returned to Canada until December 8.

"We actually became supersensitive to delays, so when parts were bumped off a flight from London for weight reasons, it seemed as though the gods were against us.

"Even though they were put on a flight just eight hours later, for us that was a major delay," Mr. Scarrow says.

Fortunately, there were a few delays at Nanticoke, but when they did occur, out came the critical path chart to search for ways of making up lost time.

When the modified end rings finally did arrive, all systems were go. Prior to their arrival, every component had been prepared, identified and laid out on the floor in the proper assembly sequence to speed up reassembly.

When the third unit came back into service December 21, it marked the culmination of 4-1/2 months of intensive investigation, planning and frustration for a great number of people on both sides of the Atlantic.

Immediately after the fire the damaged unit was dismantled to determine the extent of damage. Two Parsons generator experts were also on the scene almost immediately — they happened to be in Canada at the time.

The unit was stripped down during the August civic holiday weekend and for the next two weeks Hydro and Parsons personnel thoroughly examined every piece of it. Each particle was identified and put into a bag so that a reconstruction of the incident could be created — a procedure similar to that used by the ministry of transport in its investigations of airplane crashes.

It was determined that the sequence of events leading to the explosion and resultant fire was similar to that of most internal mechanical failures of generators.

Seals and mechanical components that contain the hydrogen in the generator casing were destroyed and the gas escaped into the atmosphere where, in combination with oxygen, it was ignited by the sparks created by the mechanical failure. Lubricating oil lines were ruptured, providing further fuel for the fire.

However, determining the damage was relatively simple, Mr. Scarrow says. "Discovering what part of the unit failed, and why, proved to be somewhat more difficult."

With the Parsons experts, a Hydro research team determined that a fracture in the unit's rotor end rings caused the failure. They analysed the material used in the manufacture, but found nothing wrong with it. The fault, therefore, had to be in the design.

"It was in the area of design analysis that Hydro's team excelled," Mr. Scarrow says. New analytical procedures, with a variety of sophisticated techniques, were developed and within three months the team was recommending design modifications for the end rings.

New forgings are being manufactured to the revised dimensions for installation in all units during the off-peak summer months to ensure that Hydro gets the maximum benefit from the changes. □

A quarter-million man-hours without an accident

Super safety

by Rae Hopkins

A golden sprig of laurel leaf — symbolic of Olympic achievement — adorns the top left corner of the gold-plated walnut shield in the foyer of the 1915-vintage two-storey red brick building on Owen Sound's main street.

Etched on the gold plating is a statement that the trophy was presented to the management and staff of Owen Sound PUC for successfully completing 251,569 man-hours without a compensable injury. It was presented by the Electrical Utilities Safety Association as a special president's award.

It is special indeed — only nine other Ontario utilities have achieved the quarter-million accident-free man-hours plateau.

Owen Sound PUC won its award for working more than a quarter-million man-hours without an accident between November 1, 1969, and February 28, 1974.

In addition, Owen Sound captured EUSA's shields for low accident frequency from 1970 to 1973.

They hang near a bank of switchgear in the utility's No. 1 distributing station, which doubles as a dispatch room, at the rear of the main office.

And around the utility that provides both electrical and water service to this city of 18,500 at the southern tip of Georgian Bay, safety is synonymous with communication.

This philosophy extends right through the main office, electrical, and water departments, say general manager John Gurnham and electrical superintendent Harold Gard.

As further evidence, Owen Sound PUC's water department displays on its walls several framed American Water Works Association (Ontario Section) certificates of merit for excellence in working safely.

There are many ways in which Owen Sound PUC puts its communications and safety philosophy into practice.

Take, for example, the time between 4 and 5 p.m. on the first Monday of each month, when the outside electrical crews abandon the aerial bucket trucks and overhead lines to attend a safety meeting. The first 15 minutes are spent in resuscitation practice.

Then the meeting is thrown open to questions or a general discussion. Mr. Gard says the crews aren't in the least hesitant to bring up anything they feel isn't the way it should be.

On occasion a "guest star" appears to explain various methods of handling new equipment. On one occasion a manufacturer's representative showed the crews how to use a new-type underground cable connector. On another an Ontario Hydro inspector discussed fuse problems uncovered in some electrically-heated homes.

Now Mr. Gard plans to have the crews review the new EUSA rule book chapter by chapter. He is going to appoint a session chairman for each segment so that crews will be sure to do their homework.

Mr. Gurnham adds that the EUSA monthly safety bulletin — a record of all mishaps in the utility industry — is fully discussed at every meeting so Owen Sound men can attempt to correct any similarities they've noticed in the accident listings.

"We don't want to become one of the statistics in the next newsletter," he says.

From time to time safety meetings are left open to discuss policy changes, too, so the crews will know what's going on.

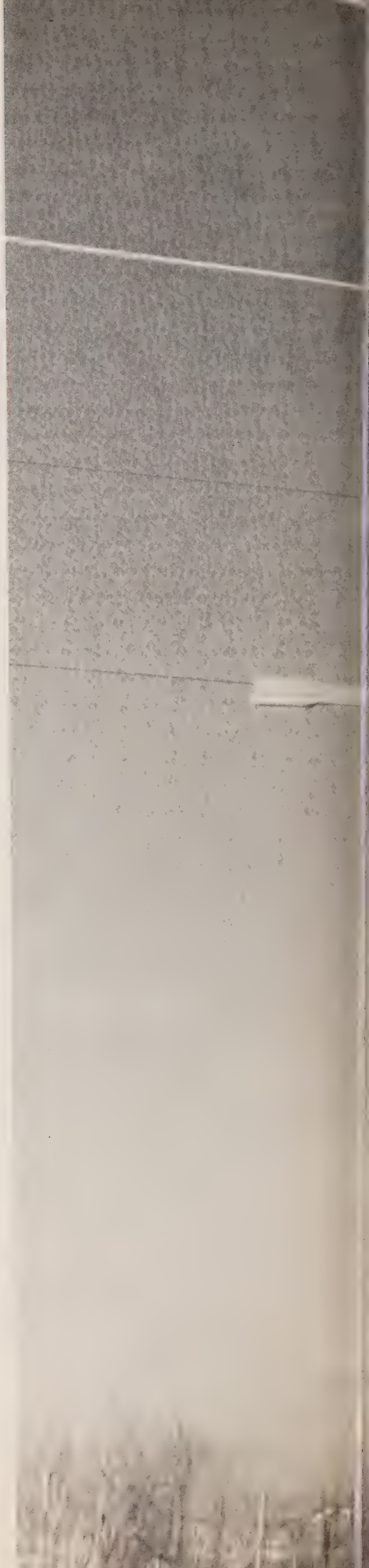
Care was taken to ensure that the crews were consulted when a new aerial bucket truck was being ordered to get their opinions regarding the safety features which should be built into the vehicle.

Whenever a new job is being laid out, Mr. Gard goes to the site with one of the two foremen to get their ideas that will assist the crews to work safely.

He says he has a "strong feeling" that a lack of communication is behind a great many of the accidents in the electrical utility industry.

Before any underground work is started, Mr. Gard sees the people in the water department, and calls the gas company and Bell Canada to find out if any hazardous conditions exist.

Owen Sound PUC owns and operates its own 44-kV system, taking power from Ontario Hydro at 44 kV and transforming it down to 4.16 kV, a standard distribution voltage.



Owen Sound line crews practice pole top rescue techniques at least once a year.



Its long-range plans call for consideration of future expansion to be served via a 13.8-kV distribution system. However, Mr. Gurnham says, since Owen Sound and Grey county are now being considered for restructuring by the provincial government, long-range planning has to be set aside temporarily.

But in the meantime, Mr. Gard credits "good equipment" for being a large part of the utility's outstanding safety record.

He says its three aerial bucket devices have "revolutionized the job of a lineman. When I was out there we had to climb and were naturally more accident-prone."

Another reason for the outstanding success in its safety program is the low staff turnover at Owen Sound PUC. For its 39 employees the average length of service is 12.9 years and for the outside electrical department employees that average is about 14 years.

"We've a perfect blend of seasoned veterans and good rookies," says Mr. Gurnham — even some of the younger linemen are already journeymen.

It's a utility that's very much tied in with the Association of Municipal Electrical Utilities lineman's training program, at which safety is a prime consideration. And its manager is a firm believer in sending personnel on courses — any course that will help Owen Sound PUC do a better job more safely.

Mr. Gurnham says the "more exposure our people have to the various methods of doing things, the more it will help us to do a better and safer job."

Why is Owen Sound PUC so safety conscious? There are a number of reasons, the primary one being that no one wants to see anyone hurt. And its management doesn't want to be negligent in anything under its control.

Accidents, Mr. Gurnham points out, cost money — plenty of it. He says every utility has to pay $2.50 to the Workmen's Compensation Board for every $100 of payroll. But if the accident frequency is high, that assessment is increased.

There's a suggestion now that utilities could save as much as 30 cents on every $100 of payroll if the accident frequency is cut.

Owen Sound PUC has put a concerted effort into operating one of the leading safety programs in the province. But there's a saying that all good things must come to an end.

And that's what happened to Owen Sound PUC. Its perfect work record of more than a quarter-million man-hours without anyone so much as suffering a scratch (although they've had some near misses over the years) was tumbled in late 1974 in a freak accident.

An employee entering an older house, converted into apartments, failed to duck under an overhead basement beam on time, struck his head, and fell backwards over a sewer pipe.

He broke two ribs . . . and was off work a week. □



Harold Gard and John Gurnham admire a special Electrical Utilities Safety Association president's award Owen Sound PUC earned for working more than a quarter-million accident-free man-hours Part of the excellent safety record is attributed to monthly safety meetings which Mr. Gard conducts for all outside staff. Resuscitation practice is featured at every meeting



The cross on the mountain

by Rae Hopkins

On a hill far away
Stood an old rugged cross . . .
go the words of Rev. George Bennard's beautiful hymn, copyrighted in 1913.

It's a favorite of church-goers the world over and this could be particularly so in the Niagara escarpment town of Stoney Creek – where a not-so-old — but rugged — cross stands guard like a sentinel over the community, high up on Hamilton Mountain.

The 50-foot structure, illuminated at Easter and Christmas by 107 25-watt light bulbs, was fashioned from a surplus 44-kV tower dismantled in the north-central sector of Hamilton, not too far from the downtown core.

The cross is the brainchild of Ontario Hydro Stoney Creek area lineman Bill Sinclair and a couple of his bucket truck buddies, Murray Hyslop and Bert Tyman.



The idea came in 1961, Bill recalls, when the trio was erecting a wooden pole atop the escarpment on which to mount a radio transmitter for two-way communication between area headquarters and its vehicle fleet.

The festive season was approaching, and a neighboring farmer was setting out the Christmas lights on a giant tree next to his house.

It then occurred to Bill that the newly-erected wooden pole could also be transformed into a Christmas symbol. And it wouldn't look so stark and lonely.

He says the design of a cross seemed most suitable because it would be illuminated during both holy seasons and "I thought we have a big beautiful mountain here and it should have a cross on it like has been done in other places," such as on Mount Royal in Montreal.

The three men immediately involved area manager Jack Halliday who "got right behind the project."

As president of the local Legion branch, Bill also enlisted support from his comrades as well as all the other service clubs in town. The result was a wooden cross mounted on a wooden structure. It lasted five years until weather took its toll.

The structure had become part of the community's heritage by this time and Bill and company felt a permanent monument should be erected in its place. A project committee was formed, headed by Bill. The Hydro members of the group knew of the 44-kV line being dismantled — so they arranged to get one of the surplus towers.

Then they approached the farmer on whose land the monument would stand for permission to erect the steel cross. The location is a small parcel overlooking the Devil's Punch Bowl — a natural gorge chewed out of the mountainside where a creek runs through.

The project became even more of a community effort: local industry contributed welders to assemble the cross from the tower, a local electrician donated the sockets and wire and the 600 feet of underground cable that would be needed to bring power to the 107 bulbs was installed by Bill's workmates on weekends. (During the 1972 strike against Hydro the crews again gave their time to paint the structure a greenish-brown to blend in with the colo scheme used by the Hamilton Region Con servation Authority, which now owns the land).

The farmer who then owned the land loaned the project committee his barn to assemble the cross and his tractor and three of his wagons to haul it to the site. A local crane rental company dispatched one of its machines and a crew to erect th cross. A local quarry operator did the blas ing to facilitate the setting of footings — also for free.

And the service clubs established a small fund in a local bank branch where the townsfolk could become involved.

Bill Sinclair is a man of deep religious conviction — but he's no Bible-thumper.

He's been an elder in Cheyne Presbyte rian Church for the last decade and befor that was "a token Christian." He says his involvement with the cross is an outlet for some of his religious convictions and he believes the natural place for a cross of Christ is overlooking the Devil's Punch Bowl.

Every year he's back to inspect and repair any damage to his project. Vandalism is his most serious problem.

"It used to be pellet guns and slingsho that caused the damage," he says. "Abou half of the bulbs would have to be replace every year, but in 1974 all 107 of them ha been removed from their sockets and tossed into the Punch Bowl."

But a Stoney Creek housewife donate a full set in time to get the lights turned o for Christmas.

Bill intends to continue his checks unt the time comes when he can no longer climb to the top of Hamilton Mountain. When that time arrives, he hopes there'll be someone waiting in the wings to take over.

To his friends and his fellow workers, he's Bill Sinclair, the religious lineman.

But to everyone else in the Stoney Cre area he's "the keeper of the cross." □



Convention 75 news

Hydro chairman warns of big rate increases

Ontario Hydro chairman Robert B. Taylor sounded a warning to municipal utilities that rate increases will be "considerably higher in 1976 than those put into effect in January of this year."

Mr. Taylor told delegates to the 66th annual OMEA/AMEU convention that rates in 1976 must provide part of the money for Hydro's multi-billion-dollar capital expansion program.

In addition, he said, 1976 rates will have to allow for acute escalation in costs from inflation and partially recover a deficit which is piling up this year.

He also spelled out the relationship between the new Hydro corporation and the municipal utilities as he sees it, and expressed his views in the matter of who owns Ontario Hydro.

"Hydro," Mr. Taylor said, "is a powerful economic instrument which must be controlled by the people of Ontario, not by single or limited interests. And control by the public means control by a central government — the province. There is simply no other way to run a public business the size of this one."

Mr. Taylor suggested that the financial implications of the Hydro board's decisions regarding its expansion program are extremely significant to the economy of Ontario.

The estimated cost of five new major generating stations and associated transmission line facilities will be about $7.5 billion. The total sum required by Hydro between 1974 and 1982 has been pushed by inflation from the $16.7 billion estimated in 1974 to $23.8 billion.

"To pay for this program, Hydro must borrow unprecedented amounts of money. But we can't borrow it all. To maintain a sound financial position Hydro must also increase the system expansion charge that is included in its rates," Mr. Taylor said.

"Unfortunately," he added, "this unavoidable need to generate more capital financing through rates comes at a time of persistent and substantial rises in cost of labor, material, fuel and equipment — indeed it is in large part a consequence of these inflationary pressures. This means that there must be large rate increases, at least for the next few years."

Another factor contributing to the need for rate increases next year, Mr. Taylor pointed out, is the projected deficit Hydro faces of about $74 million. This is largely a result of Hydro's inability when establishing rates for 1975 to anticipate the high rate of inflation.

"With the benefit of hindsight," Mr. Taylor said, "we just didn't raise rates enough.

"The 1976 rate proposals will be considered by the Hydro board next month and I expect that during April we will propose to the minister of energy increases in our rate schedules considerably higher than those put into effect this year."

Pointing out that the restructuring of municipal utilities is proceeding, Mr. Taylo noted that Energy Minister Dennis Timbre has set out a series of guidelines which emphasize the high degree of local partic pation the government wishes to see.

"One hears comments about govern- ment takeover, Crown corporation, transf of assets, and so forth. These are confus- ing terms. The real change that actually took place in the status of Ontario Hydro a a result of an act (the Power Corporation Act) of the Ontario government, pro- claimed March 4, 1974, was that the name was officially changed to Ontario Hydro from the Hydro-Electric Power Commissi of Ontario.

"This change simply recognized popu lar usage — one could almost say it was merely a christening ceremony to legalize a familiar name of long-standing.

"But," Mr. Taylor said, "Hydro remains as it was, and always has been, a body co porate created by an act of the Ontario Legislature."

Quoting from the Power Corporation Act, Mr. Taylor said the change in name does not affect Hydro's rights or obliga- tions.

He added that he found it "difficult" to reconcile with an OMEA statement con- tained in a pamphlet issued to municipal utilities to distribute to their customers. Entitled "Is This The Way You Want It?" the pamphlet stated "recently the Ontari government transferred the operation an assets of Ontario Hydro to a new Ontario Hydro Corporation."

"What happened, in fact," Mr. Taylor said, "was that the commission structure the top was abandoned and in its place a



R. B. Taylor

oard of directors was appointed. The dministration and control was transferred rom a small body appointed by the Lieu- enant Governor in Council to a larger and nore representative body appointed by the Lieutenant Governor in Council.

"The operation and assets of Ontario Hydro remain with the same body corpo- ate, or corporation, that has existed for lose to 70 years," Mr. Taylor said.

"One descriptive phrase from the past alled Hydro a government municipal co- perative enterprise. That is perhaps as lose as one can get even today, if you cknowledge the responsibility of the gov- rnment to make sure that a wide range of ublic interests are accommodated, to an xtent not considered necessary or even ontemplated in the past.

"And this accommodation of the broad ublic interest is precisely how I view the ole of Hydro's directors. Although Hydro's unction and its relationship to the munici- al utilities remain the same, the board Hydro) represents a diversity of interests nd viewpoints extending beyond those of he municipal utilities, either singly or col- ectively.

"You could look at the representation his way: the generation and transmission ide of the enterprise and its rural and ndustrial customers are represented by wo directors, the chairman and the presi- lent. The municipal distribution side is rep- esented by two directors. That's an even plit. The rest of the directors bring to the oard the broader interests of the provin- ial community: industry, commerce, nance, labor, environmental concerns, nd so forth," Mr. Taylor said.

Mr. Taylor said the equity of the munici- al utilities continues to appear on Hydro's alance sheet, and any municipality can ake off a figure to demonstrate the undi- ided interest in the business that repre- ents its investment.

"But it was never dreamed that any unicipality would say okay, we're cashing our chips, give us our money. And nless you want to exercise your owner- hip in that way, cavilling over the finer gal points of the question who owns ydro is less than productive.

"What disturbs me most, however, is the suggestion in an OMEA newsletter that the Hydro board is setting out to raise rates deliberately and unnecessarily. That statement is not only wrong, it's unfair, and I've made our feelings about it known to the OMEA.

"But," Mr. Taylor said, "we have no time for quarrels. What Ontario Hydro and the municipal utilities must do is to make sure that our successful relationship continues and that we organize ourselves to best serve the needs of our customers and the people of Ontario.

"As one way of keeping in close touch, I have suggested that the executives of your associations and the Hydro board meet regularly, say twice a year. Furthermore, the president and I intend to take every opportunity to meet your officers on problems of mutual concern," Mr. Taylor said.

Hydro does *not* belong to Crown, OMEA advised

Darcy McKeough, while minister of energy, advised the OMEA that proposed legislation "does not have the effect of placing all real and personal property and public works of Ontario Hydro in the ownership of the Crown."

In a letter to the OMEA legislation committee, Mr. McKeough stated that "Ontario Hydro is specifically exempted from the Crown Agencies Act, and thus is not an agent of the Crown simply by virtue of the legal effect of that Act."

The OMEA had expressed concern that "The Ministry of Government Services Amendment Act, 1974" would have the effect of vesting ownership of all real and personal property and public works of Ontario Hydro in the Crown.

The association submitted a proposed amendment to the bill and expressed its concerns which were reviewed by the law officers of the Crown, at the request of Mr. McKeough.

Douglas Hugill, chairman of the OMEA's government legislation committee and a director of Ontario Hydro, released part of a letter received from Mr. McKeough in the legislation committee's report to the 66th annual meeting. The letter stated:

"The Crown lawyers tell me that strictly speaking, the courts have decided that Ontario Hydro is not an agency of the Crown in Right of Ontario, and that the decisions of the court in this regard have been reversed.

"In addition, Ontario Hydro is specifically exempted from the Crown Agencies Act, and thus is not an agency of the Crown simply by virtue of the legal effect of that Act.

"The effect of this, as far as I can gather, is that where the amending bill refers to the 'government' or an agency thereof, the act does not apply to Ontario Hydro.

"On this interpretation, the act, as it will be amended . . . does not have the effect of placing all real and personal property and public works of Ontario Hydro in the ownership of the Crown in Right of Ontario."

Ownership of Ontario Hydro has been a contenious issue in recent years. Last year the OMEA issued a statement claiming that "the Ontario government has taken control of the electricity system — a system it does not legally own." This statement was mailed by many of the utilities to their customers.

Hydro Chairman Robert B. Taylor has stated in a recent letter to the OMEA that the ownership of Ontario Hydro and its assets has not been determined or affected in any way by legislation setting up Ontario Hydro as a corporation.

Mr. McKeough was recently succeeded as energy minister by Dennis Timbrell and became provincial treasurer and minister of economics and intergovernmental affairs.

Construction delays will hit supplies

Convention delegates were told that continued delays in Hydro's capital construction program will create problems in meeting the electrical supply requirements of the province.

H.A. Smith, Hydro's vice-president — engineering and operations, described the situation as serious and predicted that between 1980 and 1984 unreliability is likely to be 10 to 15 times worse that the present standard.

"The significance of this is hard to judge," he said, but he pointed out that the construction delays would be compounded by the unreliability of fossil fuel supplies, particularly since the main delays are expected to be nuclear plants which have the best reliability of fuel supply.

In terms of costs, he said a one-year deferment on Darlington (the proposed nuclear station near Bowmanville) is estimated to cost close to $500 million for replacement fossil fuel. The station is now one year behind the original schedule because of delays in receiving approval.

Mr. Smith blamed the delays on such factors as:

— a continuing demand for a better quality electric service;

— institution of tough regulations designed to protect the environment;

— interruption of traditional processes for providing electric service by lengthy, public review procedures;

— inflation of all costs;

— unrealistic constraints on the size of rate increases and long delays in approvals;

— major increases in the financing burden;

— imbalance in the demand-supply relationship of primary energy resources.

He said the principle cause stems from the insertion of lengthy processes for public planning and review into the traditional building periods.

Specifically, Mr. Smith discussed current government plans for public hearings into Hydro's long-range planning program. The hearings could take up to two years.

More than 50 major items have been identified by Hydro as items probably requiring examination and resolution during the course of the hearings, which have not yet started. Of these, 75 per cent will require early resolution to meet 1985 forecast requirements, he said.

Mr. Smith said if such new public participation processes are to be adopted without having an adverse effect on maintaining schedules, they can be applied only to plans for projects which are far enough into the future to allow for the extra stages.

As for the current long-range plan, Mr. Smith noted that Hydro had mailed out more than 14,000 copies of the document and had asked for public reaction. The response had been less than half of one per cent.

Mr. Smith said the planning processes and the other contributing factors to the construction delays for the most part represent the result of community desires.

He asked the delegates if they thought the community as a whole is judging properly the risk-benefit balance of the experiment in complex processes in which it is engaged. He also asked if the community's electric service servants are making adequate input to that judgment.

Power-at-cost issue hammered home

The OMEA has renewed its grip on the principles of power at cost — meaning no profit — and retention of the 13th bill for settling year-end utility accounts with Ontario Hydro.

No fewer than six resolutions dealing with financial issues were passed at the 66th annual meeting. In all, delegates proc essed 26 resolutions in a record-breaking session that usually takes up part of two days.

Delegates approved a resolution calling on Ontario Hydro to continue to operate o the basis of cost—"that is, the 'price payable for power' by the actual cost to Ontar when no longer required for that purpose.

Bruce McCubbin of North Bay expressed concern that costs might be inflated or padded. Outgoing president Arthur Bowker, of Gloucester Township, said the intent was that no profit should be built into power costs.

Dr. Robert Hay of Kingston said the OMEA should head off an attempt to elimi nate the 13th bill or to set "a price for power — cost, plus."

At present, municipal utilities are billed monthly on the basis of interim rates whic are based on cost estimates of supplying power in the coming year. When actual costs have been determined, utilities are then credited or debited in their 13th bills.

Delegates passed two other resolution strongly urging Ontario Hydro to retain th power-at-cost principle and the 13th bill procedure, and stipulating that no compo nent part of the cost of power should be used as a reserve fund.

Another resolution supporting the 13th bill, presented by the power costing committee, deals with surpluses and deficits.

This resolution specifies that "the max mum surplus of deficit transferable to the surplus or deficit account in any year sha not be greater than 2.5 per cent of the actual bulk cost of power for that year no shall the total balance in the account exceed at the end of any year 7.5 per cen

It specifies that any amounts in exces of these limits shall be returned to or recovered from municipal utilities, includ ing the Power District, by means of the 13th bill.

The Power District includes about 690 000 rural customers and about 100 indus trial customers served directly by Ontario Hydro. For costing purposes the Power District is treated as a municipality.



In another resolution, the OMEA seeks assurance that capital contributions made by utilities for Ontario Hydro system expansion will be used "for capital purposes and nothing else."

The motion states that "its objective in use will be to reduce and then hold the debt-equity ratio of the Corporation to within a range previously approved by the OMEA in 1973 and that it will be terminated when no longer required for that purpose."

Surge in demand or power foreseen

Although demand for electricity may eventually taper off, the OMEA forsees a marked increase in demand during the next decade.

Delegates unanimously carried a resolution saying that plans for future generation, transmission and distribution facilities should take this expected increase in electric power demand into account.

The resolution also says that the OMEA endorses the position that "the ultimate and overriding goal for all energy policy is achievement of a state of "dynamic equilibrium." However, progress toward that goal is expected to result in marked increases in demand for electricity as demand shifts from fossil fuels.

In reply to a question, Dr. Robert H. Hay, of Kingston, said that in essence "dynamic equilibrium" means that the world can't look for indefinite growth on an exponential scale that involves a constant doubling in demand for resources.

"We have to achieve a state of balance in population and we certainly can't have a doubling of energy use in all its forms," he said. "In Ontario we will see an increase in electric energy demand as other forms of energy decline."

He called on delegates to support Ontario Hydro's position that provision will have to be made for increased demand for electricity.

Cascade guarantee loss 'serious'

Removal of a 10-year guarantee on Cascade electric water heaters by manufacturers involves "a serious withdrawal of consumer protection", says Lorne Reeder, of St. George, chairman of the OMEA's marketing committee.

Mr. Reeder said manufacturers began withdrawing the 10-year guarantee in 1973. Resulting changes in material standards no longer permit use of "Cascade" as an identifying brand name, he said. He said a water heater with a five-year guarantee cannot be labelled "Cascade".

The committee report said municipal electric utilities have a $60 million investment in water heaters and that Ontario Hydro has an additional $20 million invested.

The report urged utilities to insist on Cascade standards and guarantees.

Mr. Reeder said sources of supply are being sought outside of Canada.

Meanwhile, the AMEU's marketing committee under chairman George Hammond, of Port Elgin, took a strong stand in the past year on action by manufacturers of tanks for Cascade water heaters to reduce unilaterally the warranty from 10 to 5 years. Mr. Hammond's committee recommended that utilities demand the 10-year guarantees and insist upon them where contractural agreements are in effect.

The problem has not as yet been resolved and the committee is concerned that the expensive water heater program across the province will suffer as a result.

May intervene in hearings

The OMEA should officially intervene in any hearings conducted by the government into Ontario Hydro's long-range plan for system expansion, says Richard Horkins, power costing committee chairman.

The recommendation, adopted without discussion along with the committee's report, said the OMEA should also look into the problem of a levelling off in the uses and availability of other forms of energy and make a conscious effort to obtain a state of "dynamic equilibrium".

Public hearings into Ontario Hydro's long-range plan, covering the period from 1982 to the early 1990s, are scheduled to begin this year before an independent commission. Former energy minister Darcy McKeough has indicated they may extend over two years.

Outlining power costing committee views on the long-range plan, which has been widely distributed throughout the province, Mr. Horkins said the members strongly supported development of the Candu system but suggested Ontario Hydro's report should have indicated "avenues for progress" for the Candu reactor.

The committee also recommended:

— demands for energy be met;

— any controls on the economy should be carried out through Hydro but that "Hydro should follow other government leads";

— the OMEA and the municipal utilities emphasize the efficient use of energy including new ways of using it;

— and that the OMEA support and promote the development of new concepts in the nuclear field.

New top officers elected

'Key word is involvement', says OMEA's Cousins

For most of his 57 years, Alan Boyce Cousins has been a businessman. He started early — back in the 20s — when at 11 he earned $3.60 a week delivering the Chathan Daily News to 90 subscribers in his hometown of Wallaceburg.

And now, the mild-mannered company vice-president who takes over the reins of office of president of the Ontario Municipal Electric Association, reminisces that in those days newspapers cost a dime a week with the paper getting six cents and carrier-boy getting four cents.

From that paper route the son of the local grocer amassed $400 in savings — and he bought all his own clothes from the time he was 12 years old.

A 1937 business administration graduate of Westervelt Business College, in London, Ontario, Mr. Cousins (his friends call him Al) returned to Wallaceburg and began his working career as a timekeeper with Wallaceburg Brass Ltd. and in the 32 years he was on the payroll worked his way up to company secretary-treasurer.

In 1969, with two colleagues, he founded the highly-successful Accurcast Die Casting Ltd., a company which specializes in custom aluminum die castings for such industrial giants as General Motors, McGraw-Edison, and Honeywell Canada Ltd.

When the business began, the office was in the basement of Al's buff brick, three-bedroom ranch-style home. His wife, Kathleen, acted as a secretary. Now that Accurcast is located in a 20,000-square-foot building in an industrial park in this industrial town of 11,000 midway between Chatham and Sarnia on the St. Clair Parkway (former Blue Water Highway), she still does.

"When we started out, we didn't even have a hammer and operated out of the basement for three months while we built a 6,000-square-foot plant. We've added on twice since and now have a workforce of 70," Al says.

And that's pretty much the story of Al Cousins' life. He's had little time for hobbies, for when he isn't hard at work in his business his time is taken up with community service.



A. B. Cousins

He says that with only eight years of active participation under his belt he feels like a relative newcomer as he assumes the OMEA presidency.

However, the soft-spoken, bespectacled Mr. Cousins is no stranger to municipal politics. He was a member of the Wallaceburg public school board for 12 years, sat as a town councillor for two years, was reeve for another two and mayor for three. During his second term as reeve he was also warden of Kent county.

In addition to his council and Hydro commission activities, Mr. Cousins has been on the board of Sydenham District Hospital for many years and is on the executive of District 1 of the Ontario Hospital Association.

He's also a director of the Thames Theatre and Arts Centre in Chatham. As mayor, he was for three years an ex-officio member of the Hydro commission and was elected a commissioner on his retirement as mayor in 1967.

But it was another two years before he really became active in OMEA circles and was elected a director of District 8 in 1969. In 1973 he was district president and it was then that he entered the provincial body.

While he admits to being a "new man who may see things in perhaps a different light," Mr. Cousins says he intends to continue with the association policies set by his predecessors.

"One thing this association will remain committed to is the principle of power at cost for the people of Ontario," Mr. Cousins says.

During the 12 months he's at the helm, Mr. Cousins intends to steer the OMEA on a course of complete involvement of the district associations with the provincial organization.

"The key word this year will be involvement and right now we are formulating plans to involve more people at the provincial level.

"I feel very strongly that the district groups must have more insight into the workings of the parent body. For example I firmly believe a member of a district association's government legislation committee should also sit in on, even become a member of the same committee at the provincial level. This philosophy should apply to all committees."

What he really wants to accomplish as president is to open the lines of communication between the provincial and district associations.

"Because I'm new and realize I have so much to learn, I want to bring in more people who can help me to learn," Mr. Cousins adds.

He believes the OMEA must continue to have a strong voice in the activities of Ontario Hydro and must continue to have close ties with Hydro, the Association of Municipal Electrical Utilities and the provincial government.

"You'll never hear me unnecessarily criticize Ontario Hydro or the Ontario government. Indeed, I hope that will be my strong point during my term of office," Mr. Cousins says.

Mr. Cousins is the first to admit he'd rather sit down with people from Hydro, AMEU and government and try to solve common problems as they arise.

However Mr. Cousins is emphatic when he says he doesn't want to see government — or anyone else — try to walk all over OMEA.

"Let's be fair to the people of Ontario. After all that's who we in the OMEA represent. That's what we're all about — to

Unsettled economic climate top issue – AMEU's Prentice

erve the needs of the people of this prov-nce."

The new president is all in favor of Ontario Hydro's proposed long-range expansion program and believes the need o build adequate generating facilities akes on added significance in these times f fuel shortages and skyrocketing prices.

"I want to see well-planned expansion f Hydro's system — not a hold-back — nd will continue to support Hydro's efforts o get on with the job," Mr. Cousins says.

He adds: "Of course there'll be criti-isms of Hydro's operations by the OMEA, ut they'll be constructive criticisms. We ee our role as being supportive of Ontario lydro in its endeavors to ensure an ade-uate supply of electric energy for the peo-le of this province.

"It's a spirit of co-operation that builds a etter country and this same principle pplies to Hydro in Ontario. If there's one ning I've learned in close to two decades f municipal politics and close to four dec-des in business, that's it," Mr. Cousins ays.

A strong advocate of local autonomy nd the retention of elected local Hydro ommissioners, Mr. Cousins cannot agree ith the philosophy attached to regionali-ation that a bigger municipal jurisdiction better.

He points out there have been a "lot of ings happen in the last few years that ave upset a lot of people in Ontario. Most f them have been political — and a case point is the regionalization of school oards."

He says they're more costly and it takes rever to get anything done. "Under the ew setup we have to get authorization om Chatham for the caretaker to replace broken window," he says. "Under the old ne, the janitor would just go to the hard-are store, pick up a pane of glass and put in."

Al Cousins has said he's a man who on't go off on a tangent of his own — that e wants to get people involved and work osely with them.

"I've been in business and community rvice for a lot of years. And in both I've arned that's the only way." □

Bruce Prentice gazed out his sixth floor window at Toronto Hydro's Carlton street headquarters and pointed to an unfinished highrise a few blocks away.

"You know" he said, "construction on that building stopped several months ago when the developer ran out of money. It's just now started up again."

This sort of activity has been occurring all over the province and it worries Bruce because of uncertain power demands for the municipal utilities. In fact, he placed the unsettled economic climate at the top of the list of problems and issues which will concern him as the president of the Association of Municipal Electrical Utilities.

"With construction virtually at a standstill, or at most on again off again, it is hard for the utilities to plan for expansion. Revenues could also be affected by a sharp decline in demand if the situation becomes more acute and heavy industries start cutting back."

One benefit from the economic slowdown is that material shortages, which have been acute in the utility industry, could ease, Mr. Prentice believes.

"Our supply situation has been rather chaotic, particularly with poles, cable and transformers. Declines in housing starts as well as the U.S. recession have helped to relieve this problem. I'm sure though that our members will be looking to us for guidance and opinions on economic matters and somehow we'll have to provide the information. Nobody wants to be caught out on a limb."

The AMEU president also predicted that 1975 would be a significant year for municipal utilities in the field of labor relations.

"The economic climate being what it is will add to the problems of negotiations. The AMEU will continue to advise member utilities and provide necessary statistical data and counsel."

Another area of concern this year will be the continued uncertainty over the restructuring of public utilities. The concept is tied in with Ontario's trend to regional government and while public hearings in



B. Prentice

affected areas are anticipated, Mr. Prentice believes the provincial government will delay significant action this year because of the possibility of an election.

"There has been a lot of opposition to regional government and there will be controversy over the utility situation so it seems likely discussions will be continuing until a solution is reached which will be in the best interests of the customers."

Noting that a few managers of affected utilities were concerned about their key personnel, Mr. Prentice suggested that "they don't know where they're at or where they're going. We're most anxious for public hearings on restructuring to begin or for some positive decisions in this area in order to ease the minds of managers and staff."

Mr. Prentice is also anxious to resolve a technical problem between the AMEU and the provincial government over lineman training. The AMEU has been conducting its own training program for years and recently has been providing courses for electrical contractors at their request. If the government helps to finance the training of outside linemen, it wants to have a say in the syllabus of the course but the AMEU does not agree.

"Since the course is primarily for utility employees, we feel there should be no outside interference in its operation," Mr. Prentice said.

OMEA district 4 meeting

The AMEU president is also hopeful that agreement can be reached this year with the OMEA over the adoption of a standard form of subdivision agreement which could end the confusion and discrepancies over charges for underground wiring.

Some utilities have adopted a policy for charging contractors the full price of servicing subdivisions while others only assess the difference between underground and overhead.

The confusion and controversy has placed some communities in less competitive positions for development.

The new AMEU president talked of the relationship his association has with the OMEA and Ontario Hydro. He says it's important to continue to improve lines of communication with the OMEA and suggested that his group would be making recommendations to the OMEA for active policy action.

"We still see ourselves as an advisory body and the OMEA as the political voice. We'll continue to rely on them for negotiations with all levels of government."

Bruce Prentice is optimistic about the future of the municipal utilities and feels that the major restructuring problems will sort themselves out and that Hydro's reorganization will lead to a smoother operation.

He notes that Ontario Hydro's requirements to appear before the Ontario Energy Board and the upcoming program of public hearings in connection with its long-range planning will present added activities for the AMEU.

At 52, Mr. Prentice is an engineering graduate from the University of Toronto and has been with Toronto Hydro for 25 years. He worked his way up from assistant engineer to general manager, a post he assumed in 1972.

In the winter he is an avid curler and in the summer months he enjoys cottage life. □

Behavior, not disease linked to deaths in 20s

Disease, says Ontario Hydro's assistant director of health and safety, Dr. T.R. Hamilton, doesn't have much to do with the deaths of 20-year-olds — but behavior does.

Quoting Department of National Health and Welfare statistics to delegates at the OMEA District 4 annual meeting, Dr. Hamilton noted that the death probability in the next decade for men aged 20 is 1,622 per 100,000 and for women of the same age the total is 602 per 100,000.

And he said the five leading causes of death at this age are motor vehicle accidents, suicide, accidental drowning, accidental poisoning and homicide.

"Violent, aggressive, adventurous and irresponsible behaviour with the misuse of alcohol and drugs is the leading cause of death in this age group," Dr. Hamilton said.

But for 40-year-old men, Dr. Hamilton pointed out, heart attacks are the leading cause of death and the most important health problem.

Heart attacks, Dr. Hamilton explained, are caused by fatty deposits inside the coronary arteries. "These fatty deposits are not an overnight affair — they have been laid down over many years.

"Just being a man is one mark against you." Women, he said, have fewer heart attacks and most of them occur later in life when the change of life alters their hormone production.

"Being a diabetic or having high blood pressure are other marks against you," he said. "But the main factors are eating too fatty foods for too long, getting too little exercise for too long and smoking too many cigarettes.

"Anxiety and tension play a part indirectly: first by pushing up blood pressure and second, people with a high anxiety tension level tend to eat too much, smoke too much and underexercise."

"Therefore heart attacks are partly behavioral in origin — behavior over many years," Dr. Hamilton commented.

He said Canadian babies in this century have mostly started life on cows' milk, not human milk.

"Cows' milk is very good for young cows, but it is too fatty for children. Just think about all of the ice cream, butter, mi and fatty meat that has been swallowed in Canada in the last 30 prosperous years. It has been well said that thousands of Cana dians each year are digging their own graves with their teeth. The process may start in babyhood even before there are any teeth," Dr. Hamilton said.

He added that the school bus may hav been a wonderful thing for improving Can adian education but it has been a disaste for the children's health. "Adults in cars make themselves lazy and set the exampl for lazy kids. Canadians have to get off their seats and onto their feet."

Dr. Hamilton said the government is obviously concerned about fitness as car be seen from the many messages on TV i the last year. Sitting and watching TV pla a large part in the life of Canadians and from the commercials it is obvious that th main health problems in the nation today are dandruff and bad breath.

"Health," Dr. Hamilton said, "is a personal responsibility. But doctors at Ontar Hydro have been telling employees abou the benefits of physical fitness and lettin them know about the bad effects of unde rexercising for many years.

"Much time has been spent in writing articles, talking to groups, counselling in viduals, handing out 5BX books and pro moting facilities for sports and exercise.

"For about 20 years we've been campaigning against cigarette smoking. The results are about the same as for the exercise promotion — disappointing. Younger employees don't care about ba health effects 20 or 30 years ahead. Health-oriented programs have had mos effect on the middle-aged because logic thought and fear of heart attacks or lung cancer have been motivating factors.

"Many people read exercise booklets but appear to tire themselves by reading without doing the exercises.

"And people who read about bad hea effects of smoking appear to do one of t things. Either they quit smoking — or th quit reading," said Dr. Hamilton.

wen Sound PUC chairman N. H. Robertson, left, ccepts congratulations and a special president's ward for achieving a quarter-million accident-free an-hours from Electrical Utilities Safety ssociation president D. M. Seath. Looking on is ie utility's general manager John Gurnham.



Greater input urged rom OMEA members

When he first agreed to fill a spot on the rogram for OMEA District 4's annual neeting, Ontario Municipal Electric Asso- iation's executive director Ed Nokes was o talk about shortages.

However, when the appointed time arri- ed on that January afternoon, Mr. Nokes aid, he found there was a shortage of hortages to talk about — at least material hortages.

But there are still some shortages con- ronting the association and these are the ind of shortages it cannot afford. "We annot afford a shortage of members nor an the OMEA afford a shortage of input by s member utilities," Mr. Nokes said.

Suggesting there is a need for municipal tilities to belong to, support, and partici- ate in OMEA affairs, Mr. Nokes said the ssociation serves as a group representa- ve where it would be difficult and expen- ive to represent each municipal utility ndividually.

"OMEA acts as a clearing house of leas, of information, of new practices. It erves as a source of solutions to group roblems and assists in individual situa- ons with specific information and possible olutions," he added.

Mr. Nokes pointed out the OMEA oper- tes to assist commissioners in acquiring ie necessary information to adequately arry out their policy-making role and to ssist commissioners in properly repre- enting their consumers in all electrical atters.

To illustrate, Mr. Nokes said the OMEA cted as a group representative in a bid to olve the material shortage problem with hich utilities were saddled during 1974.

"We caused a number of meetings to be eld with representatives of several gov- rnment ministries, both federal and pro- ncial, to help alleviate the situation."

"I can only say that government presentatives concluded that the pole tuation was 'hopeless' and the trans- rmer situation 'grim'." It was on these atements that the OMEA accepted the need to seek, or provide a source of supply for utilities.

Mr. Nokes pointed out the association sought out a source of pole supply and the response it received made it quite obvious the shortage experienced during the summer months has been somewhat relieved, at least temporarily. He said the OMEA found a good source of poles "right here in Ontario," which was expected to meet utilities' needs for at least January and February.

Mr. Nokes added the OMEA is pressing for an improvement in the supply of transformers by seeking removal of tariffs, at least as a temporary measure, because of the need to import them from the U.S. He said at the same time it has asked the government to take the initiative in developing improved sources of supply from Canadian manufacturers.

Mr. Nokes said the OMEA can only function properly when there is an interested and active membership. "Everyone who asks for information puts the association to work. Everyone who offers this association his views and suggestions makes an important contribution to the OMEA's ability to work — and that's what we need — your requests and your contribution."

Thermal insulation law essential, meeting told

The need for legislation to upgrade thermal insulation is essential and is supported by almost everyone in the energy business, Tom Bennett, a sales superintendent in Ontario Hydro's Central region, told delegates to the OMEA District 4 annual meeting in Toronto.

However, Mr. Bennett said, the 1975 edition of the National Building Code will contain no reference to standards for thermal insulation in residential construction.

Present standards will stay as they are until the next revision in 1977. "Two years may seem like a short span in the legislative context — but it looms much longer for a northerly nation facing ever diminishing domestic and world fossil fuel supplies," Mr. Bennett said.

He added that the provincial picture is "not much brighter with the Ontario Legislature obtaining Royal assent to Bill 62, "an act to provide for an Ontario Building Code." The act will provide for uniform building regulations across the province and will replace all municipal building bylaws.

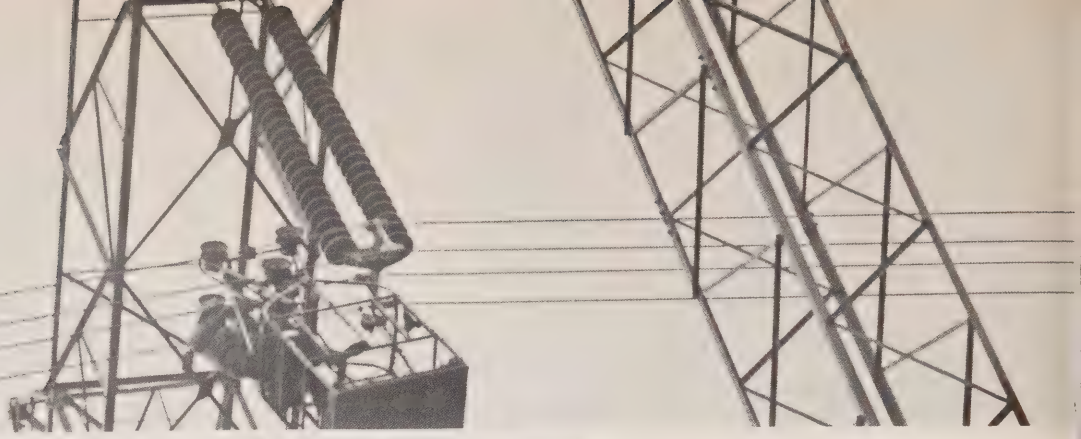
Mr. Bennett suggested that because of the increasing need for efficient utilization of Canada's non-renewable energy resources and the escalating cost of all forms of energy, the oil, gas, and electrical industries believe that it is essential — and in the national interest — to conserve energy used in home heating.

"Energy consumed in buildings classified for residential occupancy now accounts for a significant portion of all energy consumption in Canada.

"Since environmental impact bears a direct relationship to the amount of fuel extracted, transported, and consumed, any reduction in energy use for home heating will have favorable results.

"Energy savings due to reduction of heat load in residences can be redirected to industrial applications to strengthen the economic well-being of the nation," Mr. Bennett said. □

along hydro lines



Energy minister sets guidelines for restructuring public utilities

New guidelines for the restructuring of public utilities place the onus on local authorities to get on with the job.

Energy Minister Dennis Timbrell said in announcing the guidelines that the provincial government would become involved only when invited to do so by local authorities.

In his guidelines the minister recognized the rationale for establishing upper tier utilities but added "there should be no compulsion to establish upper tier regional electric utilities in regions where local authorities feel it is in their best interest to retain elements of the retail distribution system at the area or local level."

The minister said Ontario Hydro will be responsible for establishing a central steering committee for restructuring across the province and this steering committee will report to the Hydro board.

"In this way Hydro will be responsible for the general supervision of the restructuring process. Such restructuring will be conducted within the guidelines. If further amendments are deemed desirable to meet local conditions they will be decided by the Board of the Ontario Hydro Corporation in consultation with the Minister of Energy and the Minister of Treasury, Economics and Intergovernmental Affairs," Mr. Timbrell said.

Hydro chairman Robert B. Taylor subsequently named S.A. Baldwin, commissioner of Ancaster Township Public Utilities Commission as chairman of the steering committee. Members are A.G. Stacey, general manager Guelph Board of Light and Heat; L.E. Cooke, Barrie, a member of the provincial-municipal liaison committee; E.M. Fleming, representing the Ministry of Treasury, Economics and Intergovernmental Affairs; H.K. Wright, Ontario Hydro Director of Customer Service, and the chairman of each local study group requesting assistance.

D.A. Ramsay of Hydro was named executive director of the steering committee.



Dennis Timbrell

The new restructuring guidelines are based on the Hogg Committee which was established in 1973 to report to the government on the rationalization of utilities. Amendments to its report were made based on representation by groups such as the OMEA and AMEU.

Among the guidelines was one calling for future studies on the restructuring of municipalities to be extended to include the retail electrical distribution system.

However Premier Davis has already indicated that the government has no immediate plans for further municipal restructuring.

Mr. Timbrell's guidelines also call for control of the retail distribution of electricity to remain under the municipal commission form in regional or area distribution authorities when established.

It also recommends that where commission members are appointed they be named by the elected council corresponding to the area or region within which the commission operates.

"Except for the head of council, the members of the first commission should be appointed from the body of existing retail electric commission members; provided, however that appointments shall yield as nearly equal representation as possible over the municipality," said the guidelines.

Mr. Timbrell's guidelines stipulate that the first commissions shall hold office for an initial term of at least two years, but not exceeding the term of the council succeeding the one that appointed it. The retiring council must also pass a bylaw specifying whether subsequent commissioners are to be elected or appointed.

Feasibility studies are to be conducted before any restructuring is undertaken. If these studies show that even one of the existing area utilities will not be strong as a separate entity and that an upper tier utility is possible, there will be no option but to establish an upper tier utility.

The guidelines call for local option in areas where regional or upper tier utilities are not viable to determine if existing supply authorities should remain or the service be turned over to the power district.

Financial time payment plans, provided by either the province or Hydro, will help cover the transfer of assets from one utility to another during the transition.

Guaranteed periods of employment are also provided in the guidelines.

As for rates, the guidelines state that where the retail rate levels of the restructured utility will result in significant increase in customers' accounts, a phasing-in procedure is to be adopted by discounting the customers' accounts for a specified period to minimize the impact of the new rate level.

The cost of the phasing-in process is to be met through an external provincial subsidy.

First serious step

Atomic Energy of Canada Limited has taken the first serious step toward Canadian use of plutonium-enriched fuels in Canadian nuclear power reactors and

ıward establishing a fuel reprocessing ıdustry in Canada.

The idea behind the federal research ffort is to use plutonium to get more elec-ic energy, for less money, from each ound of natural uranium. The plutonium is ccumulating, unused, in spent fuel from omestic nuclear reactors.

AECL is building a $1 million pilot plant its Chalk River Nuclear Laboratories to st the technical, economic and safety asibility of fabricating uranium fuels ightly enriched with plutonium.

In addition, Ontario Hydro and four pri-ite companies are investigating the costs nd engineering aspects of a much larger ommercial plant for the fabrication of plu-nium enriched fuels.

irst since ban

anada and South Korea have signed a ontract for the sale of a Canadian-esigned nuclear reactor — the first for-ign sale since the lifting of a ban at the nd of last year on the export of all nuclear aterials.

The agreement, covering the sale of a Candu reactor to the South Korean Power o., needs only ratification by both governments before going into force.

A spokesman for Atomic Energy of Can-a a Limited says the ratification from outh Korea will have to include an agree-ent to abide by safeguards on nuclear les outlined by federal Energy, Mines ad Resources Minister Donald MacDo-ld late last year.

The safeguards require a country buy-ng nuclear materials to sign a treaty not to se the technology or equipment in the anufacture of explosives.

The purchasing country must also ccept inspections of plants and fuel by th International Atomic Energy Agency to nsure safeguards are being followed.

Announcement of the safeguard quirements December 20 ended an eight-month ban on nuclear exports posed in May after India exploded a bomb manufactured from plutonium turned out by a reactor built with Canadian aid.

AECL says total cost of the South Korean project is about $700 million, with the value of Canadian materials estimated at about $300 million.

Director dies

James J. Durand, Ontario Hydro's director of public relations for the past five years, has died at age 52.

A 25-year veteran with Ontario Hydro, Mr. Durand joined the utility in 1949 after receiving his B.A. Sc., from the University of Toronto. In his quarter-century with Hydro he held a number of responsible engineering posts across the province before being appointed director of public relations.

Mr. Durand had a life-long interest in sport and coached both minor hockey and baseball teams for a number of years.

He is survived by his wife, two sons and two daughters.

Hay on board

Dr. Robert H. Hay, of Kingston, long-time head of the OMEA's power costing committee, has been appointed to Hydro's board of directors.

The appointment was announced by Energy Minister Dennis Timbrell. Dr. Hay succeeds Andrew Frame, an OMEA member of the board, who has stepped down to assume a post with the energy ministry.

Until his retirement, Dr. Hay was a physicist with Alcan in Kingston. He was first elected to Kingston PUC in 1952 and has played a lead role in upgrading and expansion of that city's electrical service. Dr. Hay gained his M. Sc. degree in engineering physics at Queen's University in 1938 and his Ph.D. at Columbia in 1946.

Since becoming a utility commissioner, Dr. Hay has perhaps earned the reputation of being one of the best-known men in OMEA circles ever. In addition to his many years' service to the power costing committee, he has been a provincial president and is again president of District 2. More recently he was OMEA spokesman at the Ontario Energy Board's hearings into a rate review for Ontario Hydro.

He was also a member of the Ontario Advisory Committee on Energy and the Government Committee on Restructuring of Public Utilities.

Petrosar pact

Ontario Hydro has signed a long-term agreement with Petrosar Ltd. to ensure a supply of oil for its Lennox and Wesleyville generating stations.

Chairman Robert Taylor says the pact calls for Petrosar to provide 20,000 barrels of residual oil a day beginning late next year and continuing through 1991.

The 20,000 barrels-a-day quota will be equivalent to about two-thirds of the projected minimum requirements of the two stations.

Value of the contract, which is renewable for three-year periods, is about $60 million a year. Hydro will make a $30 million advance payment six months before the first oil delivery. The contract contains an option to increase this advance payment to $40 million.

Petrosar is a consortium of Polysar Ltd., Du Pont of Canada Ltd., and Union Carbide Canada Ltd. Residual oil is what is left over after the higher fractions of crude oil have been extracted, including such products as jet fuel, gasoline, diesel fuel, furnace oils and petrochemical by-products.

Petrosar's Sarnia refinery will produce about 70,000 barrels of the heavy residual oil a day from domestic crude. The fuel will be moved to the stations near Kingston and Port Hope by train.

Mr. Taylor says the Petrosar deal reflects Hydro's policy of buying Canadian whenever possible to avoid increased dependence on foreign fuel supplies.

The oil will have a sulphur content of less than 1 per cent which will allow a high degree of air quality control.

Both plants will also use oil from offshore sources. Hydro has a contract with Golden Eagle Canada Ltd. for the supply of 14,000 barrels a day of heavy fuel oil refined in Quebec from Venezuelan and other foreign crude.

Canadian residual oil production is about 600,000 barrels a day and the two oil-fired plants combined will burn a minimum of 30,000 barrels a day. They're both expected to operate as peaking units.

Although capable of burning either fuel, the planned Wesleyville station was switched from crude to residual to avoid competition with other domestic consumers for a Canadian resource expected to be in short supply.

Hydro to the rescue

It started out as a routine line patrol over Manitoulin Island for Ontario Hydro helicopter pilot Jim Boyd.

But on his way back to North Bay after checking on damage to lines in a severe storm, Jim's radio crackled with a call for help.

A light plane carrying two men had been forced down the day before and Rev. David Bould and his passenger, Willard Noland, spent a chill night on Welcome Lake — the aircraft's skis froze to the slushy ice surface.

The downed craft, on a 160-mile flight from South Porcupine to Gore Bay, was spotted by the crew of Canadian Forces search and rescue Hercules. But high winds prevented a para-rescue team from jumping to the two men.

On his way back home, Jim just happened to be in the right place at the right time when the search and rescue team's call for help came in the late afternoon.

He scarcely needed to alter course to swoop down, pick up the stranded pair, and deliver them to Sudbury airport.

municipal briefs

Newmarket Hydro's chairman since its inception in 1945, Fred Thompson, has died at age 77. Mr. Thompson was awarded a 25-year long-service citation by the Ontario Municipal Electric Association five years ago.

Glowing tribute was paid to former Blenheim PUC chairman, Alex Bowman, when a new substation was named after him to commemorate his retirement. Mr. Bowman served on the commission from 1946 until 1974.

Toronto aldermen voted to return Frederick Gardiner to his post with the Toronto Electric Commissioners for another two years. The first chairman of Metropolitan Toronto, who is now 80, defeated William Peden, a member of Energy Probe.

One of the best known names in Canadian politics, Ellen L. Fairclough, has been appointed a commissioner of Hamilton Hydro. Mrs. Fairclough has been named to fill the unexpired term of J.E. McLean, who died last October. Mrs. Fairclough sat on Hamilton city council for five years and was first elected to the House of Commons in 1953. She was a member of the Canadian delegation to the United Nations in 1950 and was the first woman to be named a federal cabinet minister when she was appointed Secretary of State in 1957. Her other portfolios included Minister of Citizenship and Immigration in 1958 and Postmaster General in 1962.

Thunder Bay Hydro Commissioner William Spicer has been elected chairman of the board of governors of Confederation College of Applied Arts and Technology in the Lakehead city. He has been vice-chairman since 1966.

Galt Hydro Manager for the past two decades, David Durward, has resigned in what the Kitchener-Waterloo Record says is the failure of the province and the regional government to reorganize hydro management under the new regional municipality of Cambridge. The newspaper quotes Mr Durward as saying his job was "made increasingly difficult" under regional gov ernment.

One of the better known names around u ity circles in the northwest, Lou Danis, ha stepped down from Thunder Bay Hydro. has been succeeded by C.A. (Swede) Johnson. Mr. Danis was appointed a com missioner of Ontario Hydro while serving as first vice-president of the Ontario Mur cipal Electric Association.

A father and son combination will have it say in the affairs of Stratford. Stan Blowe placed second in the race for a seat on t PUC and his son, Ted, came third in the aldermanic vote.

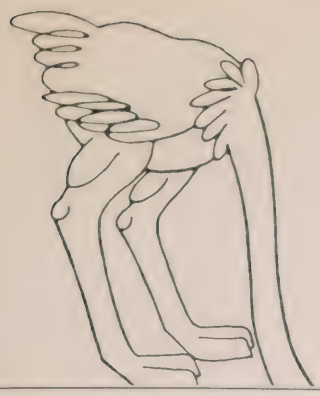
Veteran St. Thomas PUC employees Wil liam J. Underhill and Donald Muddle hav been presented with 25-year service pins Mr. Underhill is the utility's general manager and Mr. Muddle is a meter reader.

Many large utilities, especially in the Met Toronto area, will be involved in labor negotiations this year. Agreements are subject to negotiation in Etobicoke, Sca borough, York, Brampton, East York, Mi sissauga, North York and Toronto. Outs of Metro, Hamilton, Windsor, Ottawa, Kitchener, Galt and Waterloo will also b negotiating new contracts.

It was George Wright night in Chesley recently when town and PUC employees turned out in force to pay tribute to the year-veteran of the municipal political scene on his retirement.

A standard utility safety procedure may have saved a Downsview man's life whil he was installing aluminum siding on a house in Newmarket. A 12-foot section the siding touched an overhead wire an the man was thrown to the ground. But, says Newmarket Hydro manager Jim Be dle, one of the crews was working on a nearby and had set the breaker on the same circuit. Because the breaker oper automatically, the victim was probably spared electrocution, Mr. Beadle says.

A familiar figure around OMEA circles, Jessica Kennedy, wife of former Ontari Hydro commissioner Lt. Col. A.A. (Bert) Kennedy, has died at age 67. Col. Kenn is a member of Wasaga Beach Hydro.



as don wright sees it

Ve like the heft and feel of the word 'extra-olation' which describes the fine old art of redicting the future on the basis of the ast. But the process itself is not all that eliable and this is just as well because ome of the conclusions which have been rawn with the use of this technique have een pretty horrible to contemplate.

It's been applied to the extra-curricular ctivities of the third world, for example, here recreation and procreation are rgely synonymous. The results call for a ole-to-pole carpet of people so dense as render impossible any stance other than anding.

Other unpalatable items on the food-for-ought-platter being served up by a formi-able combination of egg-heads and com-uters for the future include mass arvation, terminal effluentitis and death spray bombs punching holes in our zone layer.

Alarming as these projections may be, ey are positively optimistic in comparison ith what can really be achieved by a dedi-ated exponentialist. "The number of sci-ntists in the world has been doubling very 12 or 15 years since the time of Sir aac Newton," one practitioner points out, and assuming a steady exponential owth such as we have had for a couple hundred years, every human being on e face of the earth will be a scientist efore long."

And if that prospect isn't bad enough, is fellow projects the past to suggest that thin 50 years all those scientists will be ectrical engineers!

Bear up, dear reader. If the same tech-que had been applied two or three hun-ed years ago it would have been easy to love how every living soul would be a onk or a chimney sweep by the year 75.

Speaking of our engineering future, the esident of Acres Limited has recently en quoted as forecasting dire shortages skilled engineers by the years 1980-81. t the qualifier has us puzzled. Does he an there will still be plenty of the ordi-ry variety to go around in the years ead?

■ We would be remiss if we failed to extend a special word of greeting to our many avid lady readers as International Women's Year approaches the half-way mark.

It is nice to see the gals forming ranks and marching as one backwards towards their goal of equal status with men. If there is any sign of indecision in their resolve it would appear to be with regard to their slogan "why not?".

"It's too ambiguous," one sweet young thing told us. "I wore one of these buttons for a while but it was always being misinterpreted. One guy even had two buttons of his own pinned on the inside of his lapels. When he flashed them, one read 'when?' and the other 'where?'."

We met another lady wearing a button on each chest. She'd never heard of women's year but didn't intend to miss any bets.

One dear old soul was wearing the button but she told us the question it posed was academic. Guess she meant the answer was all too obvious in her case.

In the face of all this ambiguity about the only advice we can offer the male population for the next few months is — look before you leap. As a more senior member of the coarser sex we have been finding more and more wisdom in the immortal words of the late Rudyard Kipling to the effect that "a woman is only a woman, but a good cigar is a smoke."

And before anyone tags us with the endearing title of male chauvinist pig we will hasten to acknowledge the superior position women enjoy in society by the very nature of things. This was recognized by that well known woman-of-letters Madame de Stael more than 150 years ago when she said "I am glad I am not a man for then I should have to marry a woman."

■ We read the other day how Britain imports from Sweden most of the dust and dirt it requires for testing the efficiency of the various makes of vacuum cleaners in its standards laboratories. Why in the world they would shell out good money on a special diet for vacuum cleaners is beyond us, but it has to do with the need for uniform particles in the testing procedure.

Sounds a little silly, perhaps, but innocent enough on the surface until one considers the past history of these two countries. For years the Swedes have been complaining about how the fallout from British industrial smokestacks has been wafting across the North Sea only to settle on the blond noggins and other attractive features of the Swedish countryside.

It's an ill wind that brings no good and the Swedes may be perpetrating one of the biggest rip-offs in the history of international trade. Talk about carrying coals to Newcastle!

■ Unidentified flying object reports are hardly worth a yawn these days but the number of sightings in the proximity of Hydro transmission lines and generating stations is food for thought. They've been thicker than moths around a lamppost over Pickering and speculation has it that they are drawing power from these installations by unknown techniques.

The altitude of these machines would seem to preclude the possibility of direct plug-ins and as far as we know — no one has become tangled up in electric cords. Neither have Hydro's operations people noted any unusual power losses during periods of heavy UFO activity. But the billing department is becoming concerned.

Reasonable chaps, they would be willing to discuss special off-peak rates with the little green men but free electricity is a direct contravention of the statutes governing the supply of power in Ontario.

■ Spurred on by the conservation ethic, a number of people have been advocating windpower as a clean and cheap method of generating electricity.

Good luck to them, we say, but potential Don Quixotes need be in no hurry to sharpen up their lances. There are other problems but the inconsistency of the wind and the difficulty in storing large amounts of electricity are enough to suggest that windmills for tilting purposes will be hard to find in Ontario for a long time to come. □

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the cover

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Cover Photo: Harry Wilson

hydro news, volume 62, number 3

Published by Ontario Hydro, 620 University Ave., Toronto.

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Printed in Canada.

Pricing electricity

"As every customer of Hydro knows, the cost per kilowatt-hour progressively falls with use. If government is serious in its energy conservation program it would insist that the price start low and rise with increased consumption."

This quote from a letter to the editor of the Globe and Mail suggests a growing public interest with the pricing policies for electricity in Ontario and a belief that it may not be consistent with the need to conserve energy. Critics contend that a rate structure whereby the customer pays progressively less, up to a point, for electricity, encourages greater consumption.

Perhaps it does to some extent but very little is known about the effects of price changes on the demand for electricity. And there is far more to the story than most critics realize. The whole process of affixing price tags to kilowatts and kilowatt-hours is complex in the extreme and there are no simplistic solutions to fair and optimum pricing taking all factors into consideration.

Historically, the philosophy at Hydro and throughout North America and Europe has been to relate rates to costs. Almost from the outset it had been recognized that utilities were "declining cost industries." As the output of the utility increased, or as it increased in size, the unit cost of production decreased. The declining block structure, still almost in universal use, was designed to reflect the cost of producing electricity and distributing it to the customer.

There is evidence now that the trend is changing and that, due mostly to inflation, load growth is unlikely to bring any cost advantages. A distinct decreasing cost characteristic still prevails, however, at the distribution level since a large proportion of these costs are fixed and do not vary with consumption. Considering all factors, a declining rate structure may still reflect the cost characteristics properly.

But there are a variety of viewpoints as to the direction ratemakers should be taking.

Conservationists suggest that rate structures be reversed regardless of the departure from the cost relationship. They reason that a higher end-rate would discourage consumption and thereby lessen the impact of electrical development on the environment.

Price increases anywhere in the rate structure would probably not have a major effect on the habits of electrical customers over the short term. Major appliances and heating equipment are expensive and not likely to be discarded because of the cost of operation.

High end-rates might influence electrical consumption more significantly over the longer term but there are many question marks.

Home heating is a case in point. Punitive end-rates would tend to discourage the use of electricity for this purpose. Many electrically-heated homes have been constructed without chimneys and ductwork so that conversion to other forms of heating would be very expensive.

Should rates be designed to influence people away from electricity and towards oil and gas for home heating? The idea is growing that nuclear-electric power will be the best way from many points of view to heat our homes in the future. And a shifting to other forms of energy would not necessarily result in a net gain in conservation.

Sociologists are likely to support the reverse rate structure recommended by the environmentalist on the assumption that higher income groups use more electricity and would bear more of the cost under this arrangement.

Utility spokesmen argue that rate distortions such as this are really schemes for the re-distribution of wealth and must be the responsibility of governments. They say that taxes and welfare programs are better vehicles for this purpose than electrical rates.

Economists are inclined to look with favor on rate structures priced on the closest possible relationship with the costs of supplying new load today in the belief such "price signals" would result in a more efficient use of resources. They would take peak load periods into consideration in pricing to reflect the "true cost" of providing service. Following the cost curve could influence end rates upwards.

While Ontario Hydro has always tried to base its rates on a fair apportionment of the incurred costs of generation and transmission, it recognizes the need to ensure that pricing procedures are in line with present requirements and consistent with changing economic conditions and social values.

All points of view will be taken into consideration in a series of integrated rate studies currently being undertaken by Hydro. See page 21 of this issue for further discussion. □

Research reaches out



It's always had a vital role at Hydro, but the need for research is booming

by Bob Morrow

A visitor could find the usually well-tended lawn behind the W.P. Dobson research laboratory cluttered this spring while huge cranes swung steel girders into position for a new two-storey wing.

The new wing is the most evident sign of Ontario Hydro's expanding research program at the H-shaped complex on Kipling avenue in Etobicoke. But the new wing is only part of a $10 million extension of Hydro's research facilities now under way.

Hydro has been a pioneer in electrical research for more than 60 years, but now the need is greater than ever before. Electricity generated from uranium and coal is expected to take on a bigger and bigger role in Ontario as supplies of oil and gas become tight or costly.

Ontario's swing toward nuclear power and heavy water production requires additional facilities for testing materials, analyzing problems and coming up with solutions.

As well, expanded research is needed in the broad field of environmental protection and to back up Hydro's emphasis on wise and efficient use of all forms of energy.

Other aspects of the expansion program include:

— A major building in which the huge heat transport pumps for Bruce and future nuclear power stations can be tested for reliable operation.

— An expansion of the high-voltage testing laboratory, including a new fog chamber, for the study of contamination of insulators and other power line hardware.

— A radioactive "warm laboratory" for testing materials used in nuclear power stations.

— A biological laboratory for the study of fish and other aquatic life, where their behavior can be examined so that, if necessary, protective measures can be taken in waters near thermal-electric stations.

— A new building, adjacent to the existing hydraulic models laboratory, that will be used for investigating inflows and outflows of water used for cooling condensers in fossil-fuelled and nuclear stations.

The reasons for expanding research are plain.

Ontario Hydro's success has been built on a bedrock of research dating back to 1913 when its first laboratory, with a staff of 13, was built on Strachan avenue. Gradually all of the three-storey structure was taken over for research.

In 1961, the division moved into the present building, named after Dr. William Percy Dobson, who headed research from 1914 to 1955.

Now the division has a 450-man research team headed by director J.H. Waghorne and a $13.8 million budget for 1975. The staff includes 145 engineers, scientists and mathematicians, many of whom have advanced degrees. Some are recognized abroad as authorities in their fields.

It's no exaggeration to say that hundreds of programs are under way to maintain a high degree of reliability and technical development for the power system and the 350 associated municipal utilities.

Hydro researchers are looking for answers to questions that concern everybody; how we can improve electrical service and equipment, conserve energy, reduce noise, control air and water pollution, and transmit electricity overhead or underground safely, reliably and with minimal environmental impact.

The "lab", as Hydro's research centre is known, actually houses a number of laboratories. It's a world where the laser, video screen, solid state circuitry and computer are commonplace.

A recent acquisition is a $130,000 transmission electron microscope that focuses and accelerates electrons to pass through thin metal, ceramic, plastic or carbon film to reveal their inner structure.

That's a far cry from 1913 when a photometer was installed on Strachan avenue to test lamps for municipalities who were clamoring for information on street lights.





...w $130,000 transmission electron microscope ... complement existing scanning microscope, ...t, to do metallurgical studies for Hydro. New in... ument will reveal inner structure of metals, sur... es of which are shown at right.

"Other apparatus designed for testing the evenness of filaments and the quality of the vacuum in the lamps was also installed," said the 1913 annual report, "thus putting lamp testing on an unquestionable basis."

Indeed, if an Edwardian man wearing a bowler hat made a return visit, he would be astonished at Hydro's 1975 research program.

* Boats will be bobbing in the water off the Bruce, Pickering and Lennox stations to investigate fish and plant life. For the first time Hydro biologists will be equipped

with sonar, an echo-sounding device used to track fish in the warm water plumes off thermal-electric stations.

* Lidar, a device combining both radar and laser beams, will be used to study the plume rising from the coal-fired Nanticoke station as part of the air-quality control program. Meanwhile, development work continues at Lakeview generating station on a "scrubber" to remove sulphur dioxide from flue gasses, while a close watch is kept on several promising systems under development elsewhere.

* In the energy conservation field, researchers are planning development work on a residential heat pump for Ontario conditions — a method of making more efficient use of electric energy through the use of solar energy in heating and cooling homes. They are also studying ways of recovering energy from new heat-removal systems for commercial and industrial buildings.

* In underground transmission research, Hydro has been designing and testing a system of corrugated steel duct with high-voltage conductors. The duct, eight feet in diameter, would use pressurized air as the insulating medium at 230 kV. At the 500 kV level, sulphur hexafluoride gas (SF_6), an insulating gas that shows great promise in systems designed to transmit large amounts of power underground, would be tested in the duct.

Hard, practical research and development work in less glamorous but important areas of electrical technology is also gaining momentum. For instance, since 1970 Hydro has carried out a major research program to reduce the size of overhead transmission lines. It's now paying off with the development of compact transmission tower designs and improved hardware to overcome operating problems.

In so doing, Hydro is attempting to use existing transmission lines to the maximum extent without sacrificing reliability or safety. This includes making better use of existing rights-of-way by upgrading facilities to carry higher voltages and heavier power flows.

At the same time Hydro is seeking to reduce the width of new transmission line corridors and the dimensions of towers to conserve land and to lessen the environmental impact.

Two new items of hardware have been developed to assist in meeting these objectives and in averting power interruptions. One is a bell-shaped insulator coated with a semi-conductive glaze that resists flashovers in fog, rain and contaminated conditions. The other is a mid-span torsional damper, an ingenious, weighted device that hopefully will prevent lines from galloping or thrashing around in the wind when they are coated with ice.

Hydro is conducting field trials of about 560 torsional dampers and 1,200 semi-conductive insulators at various locations. An additional 20,000 of these insulators are scheduled to be installed in the near future.

Hydro is uprating several 115-kV lines for 230-kV operation with the new insulators in prototype installations. If the prototypes operate successfully, tentative plans have been made to construct many miles of compact lines and to uprate a number of existing lines.

Meanwhile, research is proceeding on development of compact 230 kV and 500 kV towers and steel poles to carry more circuits, thus reducing land requirements. Improved appearance is an important objective, as is reliable performance.

Although Hydro's research tends to be concentrated on immediate and pressing problems, long-range considerations are never far from the surface. For example, some Hydro researchers are evaluating such mundane items as anti-freeze, paint and floor wax, while others are studying heavy water processes and heat pumps that may play roles in our energy future.

Recently a power utilization expert was preparing an assessment of the possibilities of using solar and wind power. Meanwhile, his department manager, who's a member of a federal government science committee, was attending a meeting in Ottawa to hear a report on using lasers to fuse hydrogen isotopes and release large quantities of energy.

No one expects to see a fusion reactor before the year 2000, but just in case . . .

Welcome partners

For many years Ontario Hydro virtually stood alone in the electrical utility resea field in North America. Now, although Hydro's research and development con plex is still the largest, some welcome p ners are getting into the act.

The picture brightened in 1970 wher the new Hydro-Quebec Institute of Research was founded. The institute n has high-voltage and high-power facilit unequalled on this continent and a gro ing scientific and engineering staff.

Jack Leslie, manager of electrical research for Ontario Hydro, says the c bined facilities of the two utilities place Canada in an advance and unique posi U.S. utilities have no comparable facilit

Elsewhere in Canada, Saskatchewa Power maintains a small research and development centre in Regina and the National Research Council has a small high-voltage studies group in Ottawa. Through grants, the NRC encourages limited amount of research in universit and industry.

On the nuclear scene, Atomic Ener Canada Limited has built up large rese facilities at Chalk River, Sheridan Park Whiteshell, Manitoba, and has enlisted versities and industries in developing t successful Candu reactor. (AECL also adapted high-voltage, direct current te nology to transmit power 570 miles fro the Nelson river to the Winnipeg area.)

Aside from the specialized nuclear to which Hydro is devoting increasing tion — why is Hydro heavily involved i research and development work?

Research director, J.H. Waghorne, was elected a fellow of the Institute of trical and Electronic Engineers in 197 his leadership in managing utility rese

High voltage jumps air gap between con and metal sheet as Hydro de new ducted underground transmission for large blocks of





programs, says Hydro occasionally asks external organizations to do some specific R and D work, but there are limitations.

"No such external resource is available to meet Hydro's total needs," he said. "Outside organizations don't have a power system to work on nor the necessary combination of continuing expertise, special laboratory facilities, immediate availability, intimate knowledge of the Hydro system, and the capability to mount an interdisciplinary, mission-oriented effort for major programs."

"Neither consultants, universities or government research agencies can meet these essential requirements," he said, "However, Atomic Energy of Canada Limited has suçcessfully provided this kind of resource in the special field of nuclear energy."

Mr. Waghorne said the Canadian electrical industry relies heavily on foreign parent companies for direction and research support.

"Industrial research goals differ from Hydro goals since they tend to be conservative and profit-oriented," said Mr. Waghorne. "Thus industry in Canada or even North America on occasion hasn't done the necessary research and development to have products available when required by Hydro for its system."

But, as a result of energy and environmental concerns, research horizons are broadening in Canada and the United States. Most recent efforts are focused on utility-sponsored and utility-directed programs rather than on manufacturers, with growing emphasis on co-operative research.

U.S. utility systems have set up the Electric Power Research Institute (EPRI) to carry out a number of research programs, including reserach on electric cars, superconducting transmission lines and breeder reactors.

With limited funds, the Canadian approach has been to carry out selective programs to avoid duplicating research carried out in the U.S. and to concentrate on Canadian concerns.

A task force set up by the Canadian Electrical Association in 1972 studied a long list of possible research projects and came up with three priority pilot projects: joint use of utility corridors for electrical transmission, pipelines and rail lines; development of compressed-gas insulated systems, for underground transmission, and improvements in electric distribution networks.

Mr. Leslie, who served on the CEA committee, says research will generally be carried out for the most part by established utility laboratories, where facilities and experienced research manpower are available, but industry expertise will be used wherever practical. Hydro was recently awarded two contracts, one for $200,000 and another for $81,000, to get the ball rolling. The program is expected to cost $1.4 million over a two-year period with the federal government assisting in financing.

The expected swing towards an electric economy will require large increases in generation, transmission and distribution facilities, says Mr. Leslie.

"Large scale co-operative research programs with full utility and industry participation, such as planned by the CEA, will be of benefit to all Canada." □

BOOM IN BELLEVILLE

...where new facilities help the utility help the community

When you're busy providing essential utility services to a thriving city that's attracting new industrial development at a whopping ratio of 8-to-1 above the provincial average, and settling into new headquarters at the same time, things can get hectic.

But the Belleville Utilities Commission is coping just fine, and the new combined administrative and service centre setup is a big help in meeting the city's increasing needs.

Unlike many other communities of similar size, this picturesque and historic city of 35,000, situated where the Moira river empties into the Bay of Quinte, has gone all out to attract industrial development. In fact, the largest single item in Belleville's budget this year is for funds to extend services to industrial lands in the municipality's growing northeast industrial park. There's another in the northwest sector, and that too, was sold as serviced lots by the city.

For a city that was once chiefly regarded as a placid residential community with only a smattering of light industry, growth must be well-organized, and diversified, says Industrial Commissioner Fred Bemis.

Last year, Mr. Bemis points out, the value of building permits issued to new and expanding industry totalled more than $7 million — greater than the combined total for the previous five years.

He adds that city council is not jeopardizing the community's position by attempting to bring in heavy industry that could have undesirable effects on its environment. Rather it is attempting to attract a diversification of smaller industry.

Diversified it is. Exports from Belleville run the gamut from Canadian cheddar cheese to disposable diapers.

Providing electrical service to booming Belleville has had its drawbacks for the utility.

Distribution engineer Keith Campbell notes that because of the burden on the utility's electrical crew of 20, Belleville UC has had to temporarily cut back on routine maintenance work. Some of the funds and manhours that would normally be alloted to such improvements as rebuilding feeders, installing additional circuits from substation to substation, and pole replacements, have been rebudgeted to find the time and funds to build lines to service new industry.

Another way they found to help cope with the growing demand was to contract out a part of the additional workload. For years the demand had increased between 3 and 4 per cent, but over the last couple of years this jumped to 8 per cent to a 55 MW peak, 20 MW of which was for industrial consumption alone.

Here they subcontract their billing — to Loyalist College. Office manager Bill Hales negotiated an agreement to have the utility's billing done on the college's new computer.

On the plus side, Mr. Campbell points out, many of the new industries are subsidiaries of large multi-national corporations. "Their engineering staffs know the power supply business and seldom did we end up with any of the messy jobs like designing their system. All we had to do was approve their plans and return them with any changes we wanted incorporated."

Even so, Mr. Campbell says, the industrial boom is going to eventually necessitate adding to the utility's staff which had been reduced in size before the boom. He says there'll be no end to it for some time to come — not as long as serviced industrial land can still be purchased for about $7,500 an acre.

Another big plus has been the move to new headquarters. From a 1932-vintage, two-storey office building, staff moved into a handsome, yet functional, reddish-brown brick and precast concrete single floor



Belleville's turn-of-the-century city hall (above) contrasts with the utility commission's ultra-mo headquarters, outside and inside (centre).

administration wing, attached to the utility's west-central Belleville service c tre.

For the first time in its long history, Belleville UC had all its staff under one at 459 Sidney street. With this arrange ment, communications have improved greatly. So, naturally, has esprit de cor with more efficiency through better co munications and more modern workin conditions. Administration and staff, whether involved in office duties or in repair shops for both electric and wate meters, are indeed working together.

Utility manager Neil Britton (below) and water superintendent Fred Clarke, with assistant Bruce Poste (below, right) enjoy their new working environment – it's far different from the old gas works (lower left) where Fred earned his living for years. Instrument mechanic Bob Haywood is comfortable in his new surroundings in the utility's meter shop (lower right).

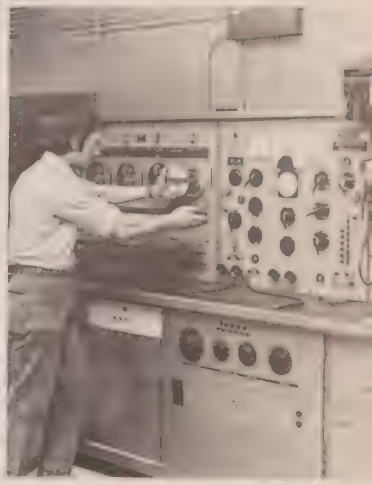












The old arrangement remains fresh in emory, too. Water distribution superinendent Fred Clarke, who's been on Bellelle UC's payroll for the past 36 years, has lot to remember . . .

It took a lot of doing for him to get used sitting in his new office without wearing hard hat.

For most of three-and-a-half decades — least until 1967 — Fred oversaw the effient operation of the water side of the usiness from a ramshackle old building at used to house the gasworks . . . where e roof leaked during a rainstorm, where the workers were pelted with hail, snow and sleet when the tarpaper roof ripped during the winter months — and where they were bombarded with pigeon pellets all the time.

But, now the silver-haired 60-year-old Mr. Clarke is comfortable — and bareheaded — in his new surroundings.

It's not just new buildings or more efficiency, or better communications, or even the concerted effort on the part of the city fathers to bring industry — and jobs — to town that make things tick in Belleville.

It's something else, too, according to Industrial Commissioner Bemis — something called "lifestyle."

So sure is he that the lifestyle Bellevillians enjoy is special, he emphasizes its characteristics to potential industrialists.

"It's the convenience of living in an area that is close to all the major facilities but does not suffer the problems of larger urban centres. I live in the suburbs and it takes me about six minutes to get downtown to work in rush hour."

To preserve this special lifestyle, Mayor Robin Jeffrey describes city council's underlying philosophy as "planning for the

New and old blend in this thriving city where industrial development is a priority item. Belleville Utilities Commission holds its monthly meeting in its new board room (top) – a sharp contrast to stately Albert College (next below) – itself so different from the new wing at Belleville General Hospital and (bottom) a cheese factory alongside Highway 401.

future — but not at the expense of the past. It's the city's tree-lined streets, a perfect blend of old world charm and ultra-modern architecture and council's concern to provide parks . . . It's an appreciation, a respect for the past that make the city what it is," she says.

The mayor's desire for a network of parks in the "friendly city" has spilled over into Belleville UC's operation, so much so that several parkettes have been established on utility-owned properties. In fact, it's the parks board that will complete the landscaping around the utility's 33,000-square foot head office complex.

Manager Neil Britton, who has been with the utility for the past dozen years, is very much in favor of the multiple-use arrangement and is quick to note that turning over utility property for park development lowers maintenance costs considerably.

Mr. Britton's links with Hydro go back to his boyhood: his father was manager of Newcastle PUC and he read his first meter when he was 12 and climbed his first pole when he was 14. And he's still a strong supporter of the local commission concept.

He was graduated from the University of Toronto in 1954 with a degree in electrical engineering, and began his full-time utility career in Ontario Hydro's junior engineering program that year. He later went to Belleville as a consumer service supervisor in the former East Central region.

But, having grown up in the municipal utility business, Mr. Britton opted for that side of the service rather than remain with the "big brother."

So did Mr. Campbell. Keith was a familiar figure around Hydro's line maintenance department from 1948 to 1970 when he chose to try his hand in private industry.

But he wasn't happy and decided three years ago the municipal field was the place to be.

Hand in hand Belleville UC and the community it serves are working to meet the needs — and desires — of business, industry, and the people who have followed in the footsteps of the United Empire Loyalists and call the city at the mouth of the Moira home. □









WOMEN on the job

by Rae Hopkins

Queens, presidents and other heads of state of about 40 countries around the world have affixed their signatures to a United Nations declaration on women's rights.

The document, presented to UN Secretary-General Kurt Waldheim, by Princess Ashraf Pahlavia of Iran, sister of the Shah, signified the official beginning of International Women's Year.

And it noted that progress toward equality between the sexes had been extremely slow and there was still a wide gap between accepted principles and established practices.

It's highly unlikely that many around Ontario Hydro or its 350 associated municipal electric utilities read the document — but it really doesn't matter.

Women are making it big in the utility business in Ontario in International Women's Year.

Around Hydro circles, Mrs. A.C. Pigott is as much at home among a dozen male counterparts in the Ontario Hydro board room as she is in the executive suite at Morrison Lamothe Foods, of Ottawa, of which she is president and chief executive officer.

Jean Pigott was appointed to Hydro's corporate board when it was created by an Act of the Ontario Legislature last year.

And around the Eastern Ontario farming community of Stirling, the name Rosa Spry is synonymous with the local public utilities commission.

Indeed, it's a one-person utility that provides water, sewer and electrical service to the town — and the silver-haired 65-year-old spinster is that person.

And there are others too.

Ellen Fairclough, the first woman in Canada to be appointed a Cabinet minister, now sits on the Hamilton Hydro Commission and Giselle Richer, secretary-manager of Rockland PUC since 1968, has been appointed vice-chairman of the Ontario Lottery Commission.

These are just a few, but there are many who would suggest that women are still lagging behind when appointments to top executive posts are being made.

Ontario's Lieutenant-Governor Pauline

McGibbon, the first Canadian woman to be appointed the Queen's representative to a provincial government is an example.

At a recent meeting of the Toronto Business and Professional Women's Club, Mrs. McGibbon lambasted Canadian corporations for excluding women from the board rooms.

"The board room remains largely an exclusive man's preserve in Canada. Only one of every 200 directors is a woman," she says.

People like Mrs. Pigott and Miss Spry are helping to change all that.

...in the boardroom

Although Jean Pigott isn't an avowed feminist, she doesn't dismiss the women's liberation movement lightly.

Indeed, she says she's "excited about it," and considers herself fourtunate to have had a father who began her business training at the age of 11 by teaching her to pay the family's bills.

Mrs. Pigott wrote her first cheque at that tender age — to pay a hydro bill.

Nevertheless, she has some pretty strong opinions on what the role of the distaff side should be in today's modern society.

Jean Pigott became president of the Morrison Lamothe company in 1967 when her father retired, but she says her training began much earlier when her father realized that one day she would eventually take over the business.

"Father's an old Scot," she explains, "and it's possible for a woman to become chieftain of the clan. He had no sons and I was the oldest of three girls so . . .

"A century from now," she says, "people will look back on what women have accomplished in the last 10 or 15 years and see that this is one of the most revolutionary periods in history.

"What concerns me most at this point in time," the first-ever female Ontario Hydro director says, "is that women's attitudes must change and the laws affecting women must change.

"This new age we're living in is throwing out such enormous challenges that I see great and exciting possibilities of men and women working together to solve the problems of the scientific and technological revolution," Mrs. Pigott says.

She adds that she feels "very much at home" in the Hydro board room.

Mrs. Pigott points out that concerns she shares with her fellow board members are not unlike the concerns of everyday living.

"There's future energy needs to be considered coupled with the conservation ethic and consumerism. Everyone living in this province, especially women, should share these concerns. People, because of education and more leisure time, want to have input into areas that affect their lives.

"Of course," Mrs. Pigott says, "it will take a few years yet for women to come into the board room. But if we do our homework it's bound to happen.

"Older men have used women to carry the coffee and type the letters and they're genuinely surprised when a woman says something sane and relevant. Women must help 'the old guard' realize they're individual human beings.

"People," Jean Pigott insists, "relate to people — not systems. It doesn't matter where a person, male or female, is on the organization chart. In my own company, and indeed in Hydro, people are our greatest asset."

She explains that at Morrison Lamothe they employ between 500 and 600 people, depending on the season.

And she draws comparisons between the firm she heads up and the corporation whose board she sits on.

Mrs. Pigott comes from a long line of women who love cooking and setting a good table.

"Cooking and baking are among the most creative activities there are. A lot hours of conflict could be eliminated if people ate a good meal first — and the held their discussions around the dinn table for it's hard to war after a good m

"Whenever I have a controversial p lem or meeting, I always make sure tha people concerned are well fed first. It' amazing how good food reduces peop antagonisms and creates an atmosph where problems can be solved.

Mrs. Pigott says Ontario Hydro is o the most dynamic organizations she h ever been associated with.

"I shall always remember standing the spot where one of the Bruce reac will be and thinking of the hours of pla ning and the thousands of detailed de sions that must have gone into this extraordinary development.

"My image of Hydro was that it wa excellent place to work with its progr for employees — coupled with good remuneration, job security and a trair



Jean Pigott

atmosphere that meant that young people coming here to work could develop their potential to the fullest.

"Three or four decades ago, Hydro was in fact a practical community college and anyone who had Hydro experience had an immediate plus when applying for another job," Mrs. Pigott says.

She admits to being like the average consumer today — having a lack of understanding of the growth in demand for electric energy. But she's learning.

"Conservation," Mrs. Pigott says, "will take the crest off the wave, but if we're going to build new cities, continue to develop our industrial base, open new mines in the north, and cope with immigration, we are going to continue to have growing needs for electric power."

Just as weather affects the demand for electric energy, Mrs. Pigott points out, it can certainly take its toll in the bread business.

"At Hydro and at Morrison Lamothe we share the same concerns for weather. Adverse weather can certainly push up consumption — and costs — for Hydro in a hurry.

"In Canada we have only something like 100 frost-free days a year — which means that any adverse weather conditions quickly affect food supplies. With the world-wide population explosion, food conservation and increased production, are priority items.

"In the energy field — just as in the food industry — production and conservation require a great deal of long-range planning and attention.

"I just wish that the food industry had been blessed with an organization with Hydro's ability to plan," Mrs. Pigott says.

Perhaps that's why the woman who instills confidence when you talk to her gets nervous" riding a high-speed elevator between 5:30 and 6:30 p.m., the normal winter peak demand period.

Like most executives, she thinks in terms of dollars. All during that brief ride, Mrs. Pigott worries about the cost of coal to power the lift.

...at the utility

Like Jean Pigott, Rosa Spry thinks in terms of dollars.

Perhaps that's because around her utility they call her secretary-treasurer — but it's a bit of a misnomer. She's that indeed — and more.

Because it's a one-person operation, Miss Spry runs the gamut from designing new sewer and water main installations to preparing billings. But she leaves the electrical system design to the experts from Ontario Hydro's Frankford area office.

It used to be that meter readers from Frankford area looked after the meter reading chores in Stirling too. That was until the 1972 strike against Hydro and Miss Spry explains that, not knowing how long the strike would last, she decided to do the job herself.

She just locked the office door for a couple of days and read the 500 meters.

"The only problem with doing that is that when you know everyone in town you have to stop and pass the time of day with them," Miss Spry says.

One thing she did prove to her commission, however, is that it would cost less to have the job done locally. They accepted her word and now the man who drives the school bus has a part-time job reading meters for Stirling PUC. He's Rosa's only employee.

The shelf in her private office (which she seldom uses) is lined with green-covered Association of Municipal Electrical Utilities guides for everything from underground installations to office practices. She used to use them when the utility had its own crew, but now the only one she uses is the office procedures manual.

Rosa Spry likes bookkeeping and she swears by the Ontario Hydro system. In fact she's carried it over into keeping the books for her church and the local chapter of the IODE.

Not an avowed feminist, Miss Spry does however feel she's doing a man's job for a woman's wage.

"I'm not completely for women's lib — it would look kind of stupid if you had a male escort and you stood and opened the door for him — but I still can't see why a woman couldn't be prime minister.



Rosa Spry

"When it comes to business, I can't see why women cannot run corporations as well as men, maybe even better. Women are more or less the backbone of the country. They certainly are the backbone of the church and most organizations I'm familiar with," Miss Spry says.

Her philosophy about running her utility

is to do it one day at a time and to worry about tomorrow when tomorrow gets here.

"When I first started here, the guy I worked for wanted to get me climbing poles but I never did though," Miss Spry reminisces.

She's seen a lot of changes since she first started as a clerk at the utility in September, 1939. At that time Stirling PUC used to collect the rural accounts for Ontario Hydro, run an appliance repair shop (Rosa used to help the repairman) and sold light bulbs and wire. But all those sidelines have long since been abandoned.

She has all she can do to ensure the town has adequate sewer and water service and electric power when it's needed.

"When the power does go off in town and people can't get me, they often call the chairman. One time he told a customer that we were just going out to do something about it that instant — that he was going to hold the flashlight while I climbed the pole to fix the wires."

She points out that it just isn't feasible for the utility to maintain a truck and employ a crew of its own.

Miss Spry has attended all AMEU Eastern Accounting conferences since 1951, and has moderated one panel on utility accounting techniques and sat on another. That was after she had suggested that women should be given more responsibility at conferences than just pouring the tea.

And that's the way the utility secretary-treasurer who can't make up her mind as yet about retirement at the end of the year, feels about the role of women in today's modern society.

...and in a 'man's world'

Women are edging into a heretofore male-dominated world.

People used to say the Mounties always get their man. They're getting their women, too, nowadays.

Back last September, four young women, including graduate archeologist Anne Valerie Pritchard, took the oath of allegiance and secrecy to become the first female constables in the 101-year history of the RCMP.

And a Toronto-born daughter of a Salvation Army officer is the new general manager of the Portland Mavericks of the Class A Northwest Baseball League.

Lanny Moss, 24, is believed to be one of the first women to head a baseball team's front office.

Before breaking into organized baseball, Miss Moss was a Salvation Army switchboard operator.

Others, too, are making it big in sporting circles.

Take for example Margaret Muirhead, wife of St. Catharines PUC's customer service engineer Ray Muirhead. She is a familiar figure at area high school basketball games — as a referee.

The mother of five is one of the best qualified volleyball and basketball referees in the Niagara district.

She's officiated in both sports in the area for eight years, but it was only in 1973 that she invaded the one-time all-male domain of boys' basketball officiating.

Then there's Dorothy Busby who during the week earns a living in Bell Canada's tax accounting department and every Sunday night is on hand at North York's Woodbine Arena where she manages a novice boy's hockey team.

And in her spare time Dot teaches power skating to her charges.

In Seattle, women have been flocking to lineman training programs with the Seattle City Light Co. and late last April, 10 of the distaff side were selected from 200 applicants.

Their training will include all phases o the line trade including underground, ov head, and station jobs. "When they finisl they'll be able to handle any job a male lineman can do," says a spokesman for utility.

But perhaps one of the most startling examples of a woman shattering a stere type is 24-year-old community college s dent Daphne Lane.

She's studying to be a blacksmith.

It took a lot of patience and pressure get accepted into the program at the Greely campus of Ottawa's Algonquin C lege, she says. The federal manpower department was at first reluctant to let a woman enroll in the physically demandi course.

But she says she's "always loved horses," and did a lot of riding in her hi school years.

She adds that despite the intense ph cal exertion, she finds the work satisfyir

"It can be frightening," she says of t horses that refuse to co-operate while s is trying to shoe them.

With a recent survey showing 10,00 horses in the Ottawa Valley and around million across Canada, Miss Lane shouldn't have too much difficulty in ha mering out a career.

And Dr. Helena Z. Lopata, chairman the sociology department at Chicago's Loyola University, suggests that the groundswell for a male liberation move ment may develop in the near future.

Dr. Lopata told a dilemmas of mode man symposium in Winnipeg recently t women's liberation has made importan changes in the female role in society – and men have often resented the move ment.

"Why should women be liberated w men are not?" she asked. "Why shoul men work to support women only to be attacked for working?"

She said that although she did not s as yet the beginnings of a male liberati movement, she can see one in the futu

Technology

An investment against catastrophe



Dr. Robert J. Uffen

Predicted world catastrophe may be averted if society invests in sufficient technology to reduce the consumption of non-renewable natural resources and increases and distributes world food supplies.

That's the view of Dr. Robert J. Uffen, dean of the faculty of applied science at Queen's University and vice-chairman of Ontario Hydro. He is one of six Canadian members of the Club of Rome.

Dr. Uffen attended a Club of Rome meeting in Berlin last fall and reported on the latest thinking on suggested limits to world growth at a meeting of the London Chapter, Association of Professional Engineers of Ontario.

"With rational economic policies and new technology, sensibly used, there need be no pollution crisis, world population can be stabilized and there could be many years of stable prosperity — but not waste and extravagance," said Dr. Uffen.

The Club of Rome membership consists of 25 nationalities drawn from business, government and the academic world. It is best known for initiating the controversial "Limits to Growth" study based on complex computer models that in 1972 projected world trends such as population growth, pollution, and exploitation of natural resources, and indicated catastrophe could overtake the globe between the years 2000 and 2100.

The Canadian Association of the Club of Rome was founded last May and has 35 members. One of the founding members was Robert B. Taylor, chairman of Ontario Hydro.

Dr. Uffen said views of members differ widely but they share the belief that unless the peoples of the world change their present policies and practices, we are in real danger of global disasters through the inability to perceive, understand and adjust in time to the complex interactions of problems troubling most nations.

Subsequent studies cast a less pessimistic light on world problems and suggest growth can be controlled and balanced if we change our ways, Dr. Uffen indicated.

Dr. Uffen outlined several Club of Rome studies under way and discussed the outlook for Canadians.

"So far it would appear that we have been living in a golden age which may soon end and might never return," he said. "It is questionable whether various governments, social organizations and business enterprises will be willing to make the changes fast enough to produce effective results.

"Affluent nations, like ours, may have to accept lower standards of living and a lower quality of life than we now enjoy.

"It is paramount that world population growth be stabilized. For a country like Canada which still provides 'baby bonuses', the cultural shock will be substantial.

"Vast amounts of money and effort must be put into technological developments such as recycling wastes or substituting for non-renewable resources if we are to come anywhere near reaching the 'optimistic' forecasts. We have only a very few decades left in which to quadruple our technology.

"Events of the past year or so have demonstrated convincingly that Canada cannot isolate itself from the rest of the world . . .

"The international stage seems set for more fuel shortages, reduced economic activity, intensified inflation, higher unemployment, disruptive economic and political policies, staggering balance of payments deficits, and deprivation and starvation in many countries.

"In Canada we are lucky. If we husband our sources of energy, process our own resources, and strengthen our capital position, we should be able to employ our people, create more capital and build an economically powerful nation.

"It would appear, from our history of technological innovation in Canada so far, however, that we may be incapable of meeting the time limits without importing most of the technology and capital from other countries. Scientific discovery can now give rise to completely new technologies in a decade, so that there is time for two or three such cycles. Consequently we neglect current scientific discoveries at our peril.

"Hope would seem to lie in developing new knowledge and deliberately exploiting it in the areas of world agricultural productivity, substitution for non-renewable natural resources, environmental management and universal birth control.

"We must curb the 'throw-away' culture. We must prepare ourselves for a world where economic equilibrium may replace economic growth as one of its basic goals.

"If these conclusions are even close to reality, then it would appear that private and public agencies will be obliged to do a great deal more long-range planning and accept a great deal more government direction and control. This may, unfortunately, not be compatible with the need for innovation.

"Our institutions of higher education, business enterprises and governments will need to develop a group of experts who will be competent not only to use the new techniques of analysis and forecasting, but to do so with full knowledge and appreciation of their limitations.

"Other nations will probably envy our undeveloped natural resources and, as their own situations become critical, they may be expected to take aggressive action against us, either individually or collectively . . .

"Mere tinkering with economic policies will not be enough if we are to have a stable future. Fundamental revaluation of present economic policy (based on unlimited future growth), is imperative.

"New technology, wisely used, based on new scientific discovery, can 'save us' by buying time. I hope I have persuaded you to join the ranks of the 'technological optimists' about the world's future and set out to try to solve the massive problems ahead, rather than to throw up our hands in despair." □



Lennox provides an alter

Flexibility of fuel supply is an important factor when it comes to producing electricity. And soon, Ontario Hydro will have yet another alternative with its Lennox generating station.

By this fall, the initial unit (No. 2) at Hydro's first oil-fired plant will be producing up to a maximum of about 575 megawatts. The remaining three units, each of equal capacity, are expected to join the system by January, 1977.

The station, located near Bath, 20 miles west of Kingston, has already produced small amounts of power for Hydro's system during tests.

Lennox and its twin, the new Wesleyville plant being built six miles west of Port Hope, are intended to be used primarily to meet peak power demands. Over the long term, both plants are expected to operate at a minimum capacity factor of about 20 per cent — in other words they will be operating only one-fifth of the time. If necessary, they could be called on for base load or continuous operation for short periods.

By the 1980s, oil will represent only a relatively small fraction of Hydro's total generating capacity, which will come mainly from water power, uranium and coal. But in a fast-changing world, it's wise to diversify. Oil-fired plants also represent considerable savings in capital costs over nuclear plants and can be built in a shorter period.

Ted Bazely, fuel resources engineer in Hydro's new fuels division, emphasize that Lennox and Wesleyville are desig to burn residual oil, which he describe "the low end of the barrel after the refi process." There is no shortage of resi oil just now; in fact, many refiners are ing difficulty disposing of it. The Hydro plants could burn either crude oil or re dual, depending on the world supply s tion, but this is expected to be limited because of the need for it in other sec of the economy.

Mr. Bazely stresses that Hydro has negotiated long-term contracts with tv suppliers for fuel and doesn't anticipa any shortfalls in deliveries.

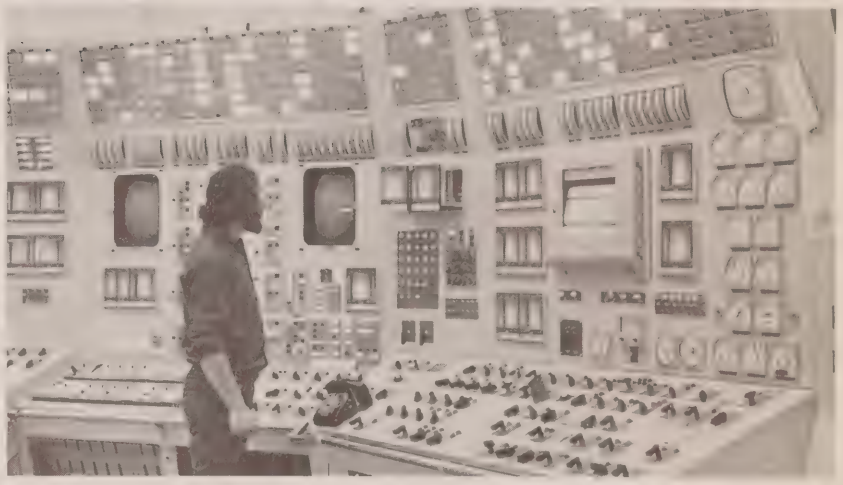
"As a matter of fact, in 1977 and 19 we're likely to have a surplus of residu

Lennox generating station, Hydro's first oil-fired plant, overlooks Lake Ontario in the scenic Bay of Quinte area. Each of its huge oil tanks contains 833,000 barrels of oil, enough to operate one of the four units steadily for about 47 days. However, controllers will call on Lennox only during peak demand periods and oil supplies will therefore be conserved.









tive

It's Hydro's first oil-fired station

by Bill Settatree

n our hands because the new Petrosar ontract is slated to come into effect and ne first units at Wesleyville won't be in ervice until 1979."

During this period it's likely that Lennox ill be operating as a base load plant etween the time it goes into service and ne first units at Wesleyville start up.

Hydro's oil contracts call for 5 million arrels a year from Golden Eagle Canada mited of Quebec City and 7.3 million barls from the Petrosar refinery under conruction near Sarnia. The Golden Eagle eliveries are already under way and three ant storage tanks at Lennox are almost led now.

Each tank at Lennox can hold 833,000 arrels. That's a lot of oil on site but each unit, when operating at full capacity, burns 780 barrels an hour.

A special system of dikes has been built around the tanks to contain any spills if a leak occurs. As a backup, Hydro has designed and built an extensive surface water drainage and purification system that will remove all oil and other impurities before the runoff reaches the lake.

At Wesleyville, a different approach is being considered: building underground storage facilities in huge caverns located under the project. They could hold almost 5 million barrels of oil more than 200 feet below the surface.

Local conditions play a vital role in the planning and building of facilities.

Lennox is located in the scenic Bay of Quinte resort area, so care was taken to shield the oil tanks from Highway 33 along the lake by creating a hilled, grassed and wooded park with 800 trees. Earth removed during excavation for the station was used for this purpose. It's expected that an outside public group will operate the park, which at first will likely be used only during the day but eventually may have camping facilities.

Every effort was made to ensure that the Lennox plant would fit into the environment. At one point plans were even changed so that the station was turned completely around to present a better appearance from the highway.

Another attraction will be a major fish hatchery on the east side of the station,

which will use warm water from the plant's cooling facilities.

Hydro has already spent almost $500,000, provided by the provincial government, in modifying cooling equipment for the transfer of the warm water to the hatchery, which will be built by the Ministry of Natural Resources.

Preliminary trenching work has been done through rock to the hatchery site. Hydro will install up to 2,300 feet of pipe when construction begins.

Special care was also taken in designing the fuel handling and shipping facilities at the site. A major dock along the shoreline was considered, but instead a railway line, entering the plant from the north, was chosen for deliveries.

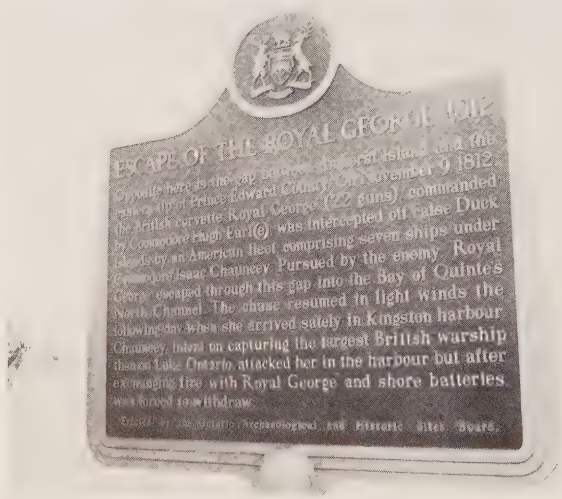
The oil-handling facility is hidden behind the station itself. Special leased unit trains move over a receiving pit at the speed of a quarter-of-a-mile an hour, dumping the fuel from valves in the bottom of the cars. The train never has to stop and 72 cars can be emptied in about four hours.

Crude oil from Venezuela and the Persian Gulf is refined at the Golden Eagle refinery in Quebec and delivered to Lennox at the rate of one trainload every two days.

These special trains may also transport residual oil from the new Petrosar plant at Sarnia when it comes into production (see following story).

And there's also talk of using a proposed crude oil pipeline extension between Sarnia and Montreal for future deliveries in temporary or emergency situations. □

History on the spot



The Lennox area is steeped in history.

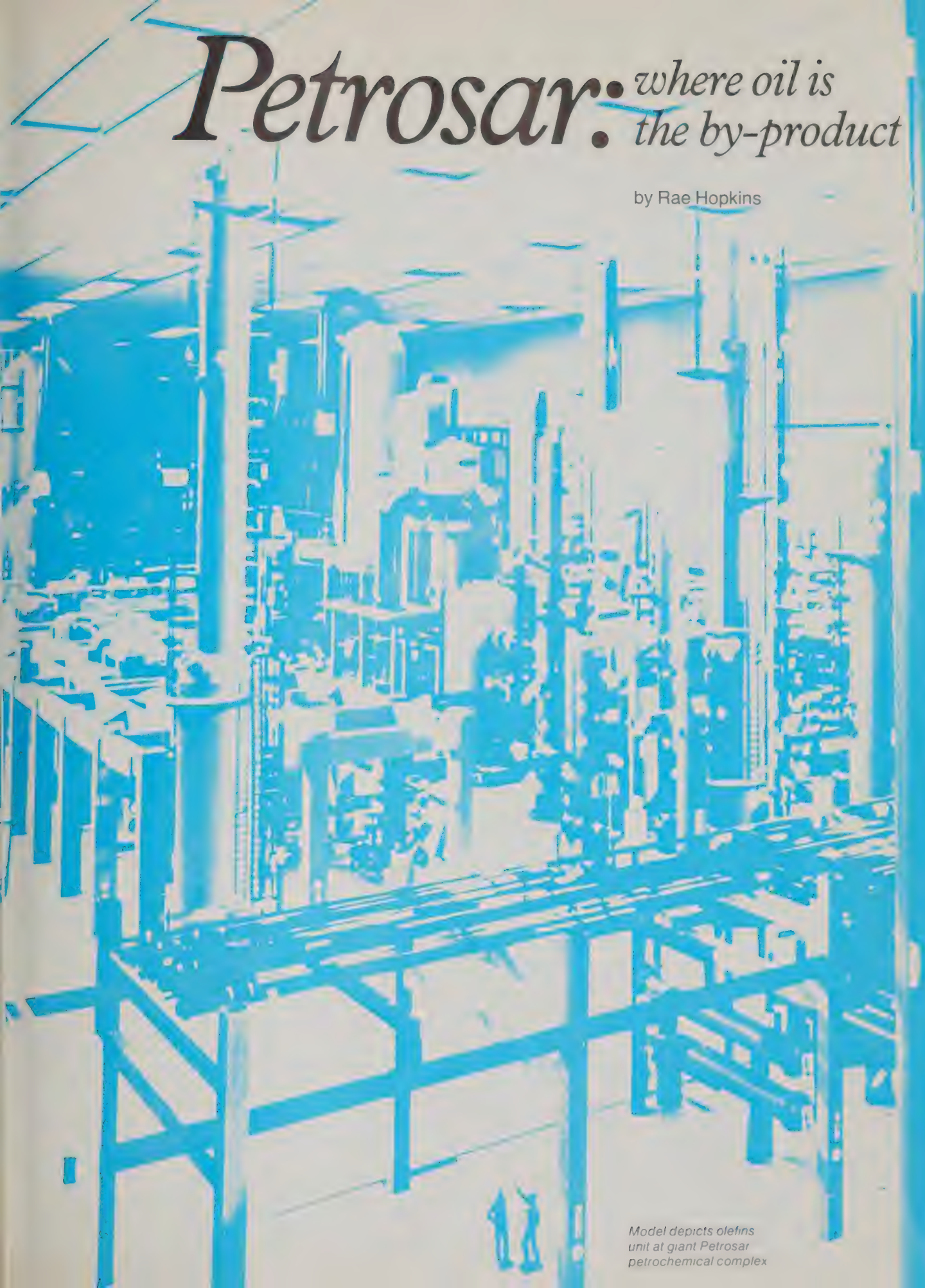
One instance is recorded on a marker right across the road from Lennox generating station. It indicates the spot where the Royal George, a Royal Navy corvette, escaped from an attacking U.S. fleet during the War of 1812.

And on the same site, just four years later, on September 7, 1816, the Frontenac was launched. She was the first steamship to ply the Great Lakes.

Now, 159 years later, another steam giant is being launched — Ontario's first oil-fired generating station.

Petrosar: *where oil is the by-product*

by Rae Hopkins



Model depicts olefins unit at giant Petrosar petrochemical complex

An oil drilling rig has been moved onto the site of Petrosar's $300 million-plus refinery outside Sarnia to assist in cavern construction for underground petrochemical feedstock storage, while in another area of the 400-acre site, a crude oil storage tank takes shape. Giants of the construction industry, like this earth-moving machine, are about as commonplace as ships are on the nearby St. Clair River.





That thick, black fluid pumped from the bowels of the earth — crude oil — bears little outward resemblance to the gas that's burned in home furnaces.

But both the heavy oil and natural gas have more in common than being among the energy sources that fuel the economy and the home. They contain hydrocarbon constituents which are particularly useful in the manufacture of basic chemicals.

It's because of these constituents that three giants of the Canadian petrochemical industry — Polysar Limited, Du Pont of Canada Limited, and Union Carbide of Canada Limited — have banded together to form Petrosar Limited. Petrosar is building a world-scale petrochemical plant to supply primary petrochemicals, extracted from Western Canadian crude oil, to the three partner companies.

Under construction on a 400-acre site that was once roamed by herds of dairy cattle, about four miles south of Sarnia and three miles inland from the St. Clair river, the Petrosar project will not look unlike any other oil refinery in Canada's chemical valley. Perhaps just a little more modernistic.

For the plant is indeed a refinery. But, unlike those operated by the nation's oil companies, gasoline and heating oil will not be the main products.

It's the ethylene, propylene, C_4 olefins, benzene and aromatics that the Petrosar partners are looking for.

And that augurs well for Ontario Hydro. For Hydro has entered into a long-term agreement with Petrosar for the supply of 20,000 barrels a day of low-sulphur residual oil (one of the commodities that's left over when the petrochemical feedstocks are seived off) to fuel its Lennox and Wesleyville thermal-electric generating stations.

The pact calls for a $30 million prepayment by Hydro six months before first deliveries are made and an additio $10 million if needed to complete the p ject. The Petrosar complex is slated to begin operations in late 1976.

Petrosar will produce more than 70, barrels a day of residual oil from the 17 000 barrels of Western Canada crude i process every 24 hours.

Fuel products, in fact, will amount t about 70 per cent of the crude oil usec

Other products that will be refined f the "black gold" that will arrive on site Interprovincial Pipelines Ltd.'s pipeline from the west includes:

—ethylene, used for such things as plastics, polyester shirts and anti-freez billion pounds a year;

—propylene, used, among other things synthetic wool sweaters, 700 million pounds a year;

— C_4 olefins, such as butadiene, used synthetic rubber tires, 500 million pou year;

—benzene, a basic petrochemical that



ends up in many products such as gasoline, detergents, nylon and dyes, 50 million U.S. gallons a year;
—aromatics, used as solvents to make products such as polyurethane foam cushions, 40 million U.S. gallons a year;
—regular grade gasoline, 8,100 barrels a day;
—No. 2 fuel oil, 30,800 barrels a day;
—synthetic natural gas, 33 million cubic feet a day.

Originally known as the Sarnia Olefins and Aromatics Project (dubbed SOAP), Petrosar began as a development study by Du Pont of Canada Limited to determine if it would be possible to produce petrochemicals in the Sarnia area that would be competitive in price with other North American sources.

A shortage of ethylene at a price competitive with feedstock on the U.S. Gulf Coast in the late 1960s prompted the petrochemical industry to probe future sources of supply.

Du Pont was joined by Polysar and Dow Chemical of Canada Ltd., which had similar raw material shortage problems, to look into the feasibility of establishing a world-scale ethylene facility in the area.

The initial concept had the consortium buying naphtha from crude oil refiners and converting it into the products in which the industrial trio was mainly interested — ethylene, butadiene, and benzene.

But, it wasn't long before SOAP realized that refiners weren't interested in selling their naphtha — it was more valuable to them in the production of gasoline.

And because the refiners weren't interested in selling naphtha, the partners had to become not only makers of petrochemicals, but refiners of crude oil too.

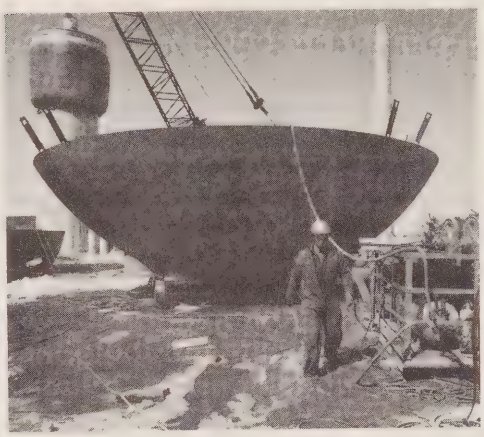
What in effect was happening, then, was that the petrochemical companies were now integrating, backward, into the refinery business — a sharp contrast to the forward integration the refiners had made into the petrochemical business in the mid-1950s.

However, Petrosar states in a November, 1974, background report on its project, that primary petrochemicals at North American competitive prices are essential for the survival of Sarnia's petrochemical industry. Without such, and without increased supplies, both Polysar and Du Pont would be forced to reduce operations in Sarnia under increasing pressure brought about by lower-priced imports.

"With primary petrochemicals available at competitive prices," Petrosar says, "new facilities could be built in Sarnia to take advantage of this production.

"Union Carbide has already unveiled plans to build a $365 million-plus complex on a new site near the Petrosar project and

Welders ready the cap for a tower for one of the cracking units at Petrosar's refinery. Primary petrochemicals are extracted from Western Canada crude oil in these units.



both Du Pont and Polysar have announced plans for expansions of existing facilities."

The nation's need for petrochemicals is increasing every year. Indeed, they are essential building blocks for many Canadian industries. Without an adequate supply from Canadian sources, many of the nation's important industries have become increasingly dependent upon unstable world supplies.

The Petrosar complex includes three major process areas, a crude oil unit, an olefins (ethylene, propylene, butadiene) unit and gasoline processing and aromatics (benzene and toluene) units.

In terms of cost and complexity the most important of the units is the olefins unit. There, naphtha is transformed into chemical and fuel-type hydrocarbons by cracking it at extremely high temperatures and separately recovering the various components. Some of these are sold as gases while others are handled as liquids. Most of the liquid streams require further processing in the gasoline and aromatics units before being sold to petrochemical users or to energy product marketers.

The gasoline treating unit and the aromatics unit process sidestreams from the olefins unit to produce benzene and by-products used for blending into gasoline.

To obtain the economy of construction and operation needed for low-cost products for Sarnia area industry, all of the units will be large, single train facilities, (in which all processing is done), a feature consistent with modern petrochemical plant design.

In addition to the basic process units the plant will contain storage tanks for crude oil, by-products and finished products. Cooling water will be recycled through a closed system and cooled in a cooling tower. Steam will be generated by process heat recovery facilities supplemented by separate boilers.

A modern biological waste water treatment system will process the relatively small quantity of water that becomes contaminated during process operations. The flare stack is designed to operate without smoke under all but major emergency venting conditions.

Ontario Hydro will supply electric power to drive the giant motors and compressors over a double-circuit 230,000-volt line from its 230-kV network.

It's expected Petrosar's initial load will be between 30 and 35 MW and the power will be fed into its own 230-kV transformer station.

Because of the Petrosar development, Hydro's list of direct industrial customers is growing. For example, Union Carbide's new plant, south of the project, will require between 40 and 55 MW and a planned expansion at the Du Pont refinery a few miles to the south will tap the provincial power network for somewhere between six and 16 megawatts.

Not only is the Petrosar project unique in the way it operates as a refinery, but it's also unique in its financing arrangements.

A group of banks under the leadership of the Toronto Dominion Bank have syndicated to float a $300 million loan toward the $430 million project. This is the largest project loan in Canadian history. Petrosar president S.P. Smith says the aggregate loan together with shareholder equity commitments and prepayments under certain sales agreements are expected to provide all the finances necessary to meet forecast cash requirements.

What about securing a supply of crud oil in the face of widespread controversy over the pricing of Alberta crude?

John Sheehan, recently appointed vic president, administration, says Petrosar has been assured that a supply of crude will be available when the plant is ready t start-up.

Mr. Sheehan, a financial authority in t fields of air transport, food and paperma ing, who is making his first venture into t petrochemical business, suggests that th banks wouldn't put up the money they di if there was any fear that crude oil would be available in sufficient quantities.

"Whether or not there's a net shortag of domestic oil in Canada, we expect tha Petrosar will have enough to meet its needs," he says.

He says that Canada will, either throu home production or imports, have suffi- cient oil to meet all its needs.

"That Sarnia to Montreal pipeline (which isn't part of the Petrosar setup) i two-way avenue for transporting oil and represents assurance in case of an eme gency in Eastern Canada. However, if th need arises to import oil from other part the world, the Sarnia area can get its sh through that pipeline," Mr. Sheehan sa

He adds that Petrosar's staff is in cor stant touch with the Alberta Petroleum Marketing Commission with which they negotiating for the purchase of a supply crude.

And perhaps the need for a Petrosar project is best stated by Dr. Robert Rich ardson, president and chief executive officer of Du Pont who is quoted in the March, 1975, issue of Executive Magaz as saying "we (the petrochemical indus need only between 4 and 7 per cent of Canada's hydrocarbon resources to su the entire chemical industry: plastics, s thetic fibres, the whole works. That's n lot.

"If we can have proper conservatior methods and an adequate stream for o total needs then we've got a real poten in this country which isn't matched by many." □

A fair price for power

Costing and pricing electricity involves many factors and skills

by Bill Settatree

Pricing electricity in the fairest possible way to all classes of customers is a complex proposition under the best of circumstances. Add such considerations as inflation, resource conservation, environmental impact and social welfare to the process, and rate-making calls for the wisdom of Solomon.

That's why the people charged with this responsibility at Ontario Hydro are calling for input as they come to grips with an integrated series of costing and pricing studies currently under way to ensure that electrical prices in Ontario reflect the best interests of the people — all things considered.

Special efforts are being made to obtain the views of a number of Hydro's customers. Meetings are planned with the Association of Direct Customers of Ontario Hydro, the Canadian Association of Consumers and both the Ontario Municipal Electric Association and the Association of Municipal Electrical Utilities, says Don Ramsay, study co-ordinator.

The studies are to be completed by the end of this year and recommendations made for incorporation into the rate structure by 1977.

The year-long study comes at a time when utilities everywhere are rethinking their corporate policies in the light of galloping inflation. This year, for instance, Hydro has had to go to the Ontario Energy Board with a proposal for increases of about 30 per cent in its rates to municipal utilities and large industrial customers. This is the highest rate increase in the history of Hydro and is currently under review at public hearings.

With a proud history of supplying low-cost electricity, Hydro is concerned about the effects of these increases on its customers. The provision of power at the lowest feasible cost is a continuing objective.

The basic philosophy underlying rate-making from the outset of the utility industry in the late 1880s has been to relate rates with costs. It was recognized that utilities were "declining cost industries." As the output of the utility increased in size, the unit cost of production decreased. By encouraging its customers to use electricity effectively, the utility could provide the additional advantage of low rates.

The declining block rate structure reflected the cost of producing and distributing electricity.

In recent years many utilities have been finding that economies of scale are no longer sufficient to offset inflation. To some, it seemed the time-honored relationship had reversed and that the greater the increase in load the greater the increase in unit cost.

Such a fundamental departure from the traditional pattern, coupled with the need to conserve fuels, concern for the impact of electrical development on the environment, and the idea that prices should be consistent with the customer's ability to pay have led utilities, governments and special interest groups to examine electrical rates with a new interest.

As with most complex problems there is a tendency among critics to look at rates

Representatives of direct customers meet with Hydro's study team to discuss future rate policies



with tunnel vision — depending on where the viewer stands and what he wants to see. Ratemakers have the responsibility to take the full range of implications into consideration in pricing their essential commodity — and there are many.

There are arguments that those using the most electricity should be charged the highest per unit cost. There are suggestions that rates should be higher during peak periods of the day or even at different seasons of the year depending on demand and availability.

And there is a school of thought that says utilities should use new methods of costing that bear a more realistic relationship to the present-day value of their facilities and equipment.

Some economists argue that as present pricing is below marginal cost (today's cost of production and supply for additional electricity demands) that this leads to wasteful and inefficient usage.

The attention of environmentalists is centred on social costs and they argue that these costs are not properly recognized by utilities in their existing rate structures.

The philosophy of charging the biggest consumers the highest rates is probably the most controversial scheme which has been advanced.

Roland A. Kampmeier, a rate consultant from Chattanooga, Tennessee, told Ontario utility commissioners at the recent OMEA convention that such inverted rates are not realistic and would not bear a relationship to costs as far as Hydro in Ontario is concerned.

He questioned the wisdom of imposing unrealistically high prices on increased use of electricity as a means of conservation, and of using such rate structures as a means of redistributing income as the Mexicans have recently done.

Under the scheme adopted in Mexico, a family can buy up to 50 kilowatt-hours a month at about 3 cents a kwh. The next 50 kwh costs 5 cents and anything above that costs more than 7 cents.

The primary reason for adopting the scheme was to keep the cost of power for the smaller user down at the expense of bigger users.

The income redistribution factor is one of the arguments of rate critics in the United States where some regulatory commissions have already recommended lower rate increases for smaller users — or even exemptions in some cases.

In Maryland, for example, a consumers' group appealed in 1970 for rate increase exemptions to families earning less than $5,000 a year or on welfare. The plea came during hearings into rate proposals of Potomac Electric Power Company.

The exemption idea was rejected for practical and legal reasons, but four years later, in 1974, the state regulatory commission ruled that low-use customers had not contributed to the need for new investment by the electric utility and should not be required to bear the burden of significant rate increases. The company was required to eliminate from its proposed rate schedules any increases on customers using 400 kilowatt-hours or less per month. The extra costs were then shifted to the high usage rate blocks.

In Michigan, some Detroit Edison customers were given relief when rate increases were levied only on those using more than 200 kilowatt-hours per month.

In 1973, the New York state examiner, considering a Consolidated Edison rates proposal, concluded that a radical reduction or inversion of the declining block structure should not be undertaken without thorough analysis and impact studies. But at the same time, stepped-down rates for high-use customers were discontinued in some categories as a conservation measure.

Among other rate changes authorized recently in the United States are seasonally-adjusted rates. Customers are charged more per unit in peak air-conditioning seasons than in winter months when the demand is lower. (Ontario's peak demands occur during the winter.)

In Britain, a so-called "white meter" tariff has been imposed under which higher rates are charged during daytime hours when the demand for electricity is greater than at night. The cost of extra metering equipment requirements have cast doubt on the value of such a scheme.

Similar double metering and off-peak rates have been adopted in some U.S. jurisdictions. In Ontario, off-peak rate p isions for industrial power are under review.

These are some of the questions util are asking themselves as they take a ne look at their rate structures in the light c changing economic and social conditic Underlying much of the basic concern the growing problem of financing expa sion.

In the past five years, electricity rate Ontario have risen by about 40 per cen and this year they could go up another per cent if the Hydro rate application is approved.

The extraordinarily high increase re from inflation and Hydro's $25 billion expansion program over the next seve years.

The rising cost of fuels has a signific bearing on rates. Already, estimated fu costs for 1975 have exceeded those fo cast in Hydro's proposals a year ago tc Ontario Energy Board and, as a result, $62 million deficit is expected.

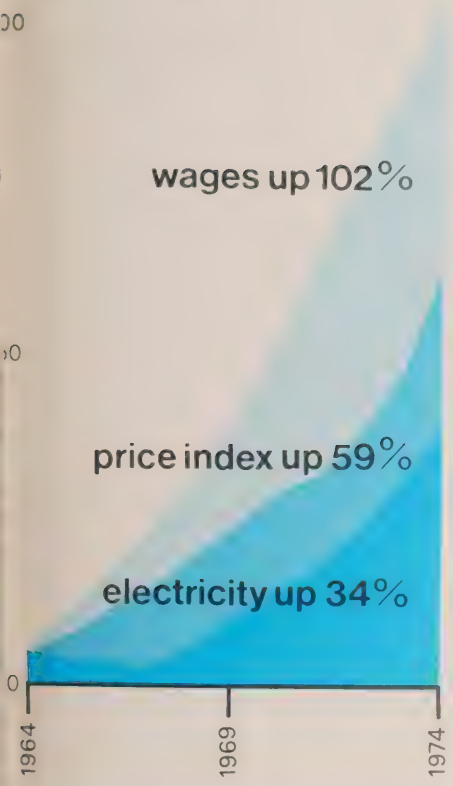
Coal prices have escalated 250 per since 1973 and are expected to jump 5 per cent this year and a further 21 per in 1976. Oil costs have tripled since 19 and natural gas prices have doubled ir same period. Hydro expects its total fu bill in 1976 to be $436 million compare with $277 million in 1974.

In the U.S. some utilities are getting mission for interim rate increases ever time the price of fuels goes up. Other u ties are reassessing their policies to d mine whether a once-a-year increase escalation built into it is a fairer way of dling rate increases.

Hydro's year-long study is examinir virtually every angle, says comptroller Burdette, chairman of the pricing and ing steering committee. Basically, thei four major study areas: pricing, costin demand elasticity and impact.

The heads of the various study tea meet and also report to the steering c mittee on a regular basis. More than a dozen people are directly involved in program and other resource people a

Cost of electricity 1964-1974



ılled upon when required.

At such a meeting on April 16, the study am chairmen outlined the principles volved in their investigations and then changed views with the representatives the Association of Direct Customers of ntario Hydro.

Rates to large industrial users, including low charges for interruptible power, me under fire at the 1974 energy board arings. It was argued that Hydro was arging too low a rate for interruptible wer that seldom had to be interrupted d manufacturers appeared to be getting n power at bargain basement prices.

The industrial customers, through ADCOH, have indicated opposition to any rate changes that would significantly increase their per unit cost differential. They argue that the demand from industrial customers will remain relatively steady in the future and that residential and commercial users will be responsible for growth pressures on Hydro.

The question of just which customer groups are exerting the pressures on Hydro's costs will be examined in detail during the study.

"We're examining various issues from various sectors of the community and will eventually formulate a policy in principle and use it as a guide," says Gordon Davidson, who heads up the special pricing committee.

Conservation of resources will be in the forefront of the studies.

Flat-rate water heaters, whose rate allows unlimited use of electricity at a fixed price, will be studied to determine if they discourage conservation.

The studies will consider the impact that additional internal financing will have on current rate levels and how the cost of capital required for new facilities should be allocated between present and future customers — whether a portion of rates should be earmarked for capital construction.

Over the years Hydro has always strived to match the timing of costs with the benefits so that customers pay the costs when they receive the benefits. Much of the financing of new facilities has been obtained through bond issues, but costs have risen so much in recent years that Hydro felt it necessary to seek an increase in the amount of money provided through rates to reduce borrowing. This equity financing has brought criticism that customers today are being charged for services to be received by future customers.

Other areas under study include the recovery of customer costs through service charges; whether pricing should be based on a fully-distributed costing system or long-run incremental costs; whether inelastic demands should be charged different rates than elastic demands, and whether retail pricing should be based on individual metering rather than bulk metering in multi-unit buildings. Bulk metering is a common practice in shopping centres and apartments where one meter serves the entire development.

One of the arguments in favor of bulk metering is that it reduces the cost of facilities and administration and collection costs to both the supply authority and the building owner as well as the end user.

However, preliminary research which is still continuing in the U.S. Office of Energy Conservation and Environment indicates that between 20 and 40 per cent more electricity is consumed in buildings with bulk metering. A tenant who pays a fixed hydro bill appears to be less inclined to turn off heaters, lights, stoves and other appliances.

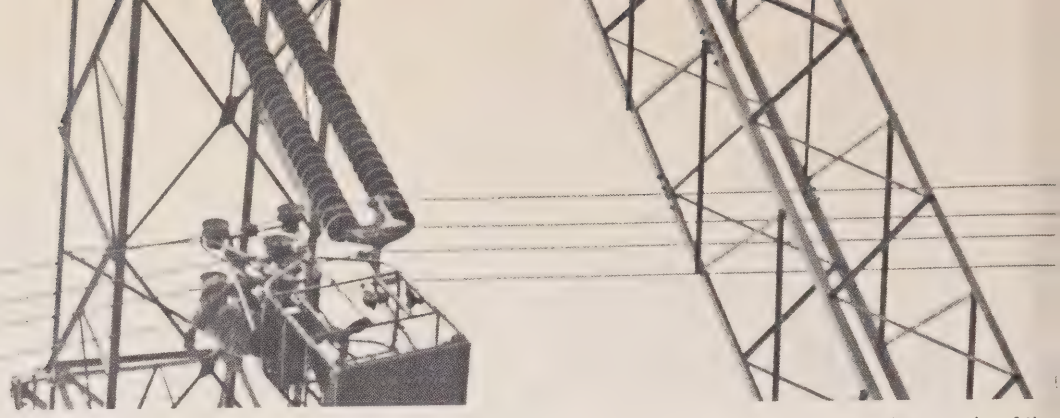
In addition to the conservation ethic, the argument against bulk metering is that individual meters ensure that all customers are treated fairly in accordance with the amount of electricity they consumed.

Demand elasticity is another area which will be closely analyzed. Load forecaster Larry Higgins will be seeking to determine if the demand for electricity varies with rates, the price of competing energy sources, and the level of income.

Threading its way through the entire study will be paramount concern about the impact of rates on the environment, on the economy, and on the lifestyles of Ontario residents. Impact study co-ordinator is economist Mo Reinbergs, who will consult with the other study teams and evaluate what the impacts of the final recommendation might be.

The year-long study, now approaching the half-way mark, is right on schedule. Co-ordinator Don Ramsay is optimistic that the teams will meet their deadlines and make significant recommendations to the Hydro board for 1977. □

along hydro lines



Energy safeguard

Energy Minister Dennis Timbrell has told the Ontario Legislature that the government hopes to cut the province's energy bill by $1 billion annually by 1980.

"Energy Ministry studies firmly indicate that present supplies are beginning to fall short of total Canadian needs and committed exports," Mr. Timbrell said in introducing a government plan to safeguard Ontario's energy supplies.

He said the plan is to be voluntary, but warned that the government is "prepared to legislate and regulate if necessary" to get the province off what he called its "energy binge."

Ontario consumers and industry will pay $5.6 billion for energy this year. Mr. Timbrell said this could be doubled by 1980 if present consumption rates are maintained.

He added the government will lead the way by demonstrating savings in its own operations, and will provide technical assistance and proven practical plans to private industry and residents.

The government has already started to save energy by various means, Mr. Timbrell said. Halton School Board cut $75,000 from its 1973 bill of $1 million by using proper heating, air-conditioning and lighting techniques.

Mr. Timbrell cited the case of one public building where energy consumption was cut by 84 per cent just by turning a valve.

The province is also converting its fleet of snowplows to diesel-power, which will eventually cut energy consumption by 25 per cent.

The Legislature was also told the Ministry of Agriculture and Food has research under way to cut fuel needs for growing vegetables in its greenhouses; the Ministries of Colleges and Universities, Education, Housing and Government Services will investigate proper heating, lighting and air-conditioning in public and private buildings and homes.

Consumer and Commercial Relations will include higher insulation standards in the Ontario Building Code, Industry and Tourism will conduct seminars and provide consulting services for industry and the Ministry of the Environment will contribute to the savings with recycling programs and information on the environmental aspects of district heating systems.

And Mr. Timbrell said, the provincial program will be updated as technology develops.

Millions in savings

Canada would save millions of dollars a year if its railways were run by electricity says B.C. Hydro chairman David Cass-Beggs.

Mr. Cass-Beggs told a conference of the Engineering Institute of Canada that electric railways would save more oil than the Alberta Syncrude project will produce — and at less cost.

"In terms of energy values, the saving, allowing about $100 million a year for the electricity required, and with the price of oil at $11 or $12 a barrel, would be about $400 million a year, or far more than enough to build the entire electrified railway system," he said.

Mr. Cass-Beggs also suggested the establishment of a Railway Electrification Authority to oversee the setting up and running of the electrified system. (For more details on railway electrification in Canada please see Hydro News November-December, 1974, issue).

D_20 plant approved

Ontario Hydro has been given the go-ahead to build a fourth heavy water plant at its Bruce nuclear complex, Energy Minister Dennis Timbrell has told the Legislature.

In announcing government approval, Mr. Timbrell said the plant represented a further step in the development of the provincial power system and the security of supply of electricity for the needs of the province.

"By committing construction of the plant now it will be possible to begin pr uction of heavy water early in 1980, in t to contribute to the (heavy water) need the second generating station now und construction at Pickering," Mr. Timbrel said.

Approval to build the second and thi heavy water plants at the site was giver July of last year. The plants are slated t come into service in February and July 1979. The first plant began producing i 1973.

Each plant will have a nominal capa of 100 kilograms of heavy water an hou

Rate Increases

Hearings are now underway by the On Energy Board into Ontario Hydro's pro posed 1976 rate increases.

The hearings are expected to take weeks with the board making its final report to Energy Minister Dennis Timb by August 31.

Hydro has applied for rate increase averaging nearly 30 per cent for the m ipal utilities and direct industrial custo ers. The average increase to the utiliti 29.7 per cent. However the actual inci to each utility will vary in most cases between 27 and 31 per cent accordin its demand, energy use and local sup conditions.

The average homeowner with a Hy bill of $14.25 per month could expect increase of $3 to $4 or 10 to 15 cents day, said Hydro chairman Robert B. T

For 1976 an increased proportion total rate will be related to energy use order to reflect the greatly increased of fossil fuels, the chairman said.

"The cost of generating and transi ting electric power is being pushed hi by increases in the price of fuels, mat and manpower," said Mr. Taylor. "Alr estimated costs for 1975 have exceed those forecast in our proposal of last

vhen 1975 rates were established. As a esult, a deficit of $62 million is expected or this year.

"The 1976 rate submission must not nly attempt to anticipate costs and eco- iomic conditions eight to 20 months from iow, but must also take into account the mount by which 1975 rates are expected o fall short of 1975 costs, which have risen ar beyond our estimates of a year ago."

Mr. Taylor said fuel costs are the largest ingle factor contributing to the higher osts and he estimates the price of fossil uel to Hydro will rise to $436 million in 976 from an estimated $277 million this ear.

Nothing has changed'

lunicipal electric utilities have built up iore that $800 million to retire Hydro's itial debt, says Ontario Municipal Electric ssociation president Alan B. Cousins.

In an address entitled "Nothing Has hanged," he told a province-wide gather- g of well-wishers at a Wallaceburg testi- onial dinner in his honor that the OMEA's ember utilities have also accepted new nd increasing obligations on behalf of ydro and the $800 million equity does not clude the assets directly under the con- ol of the municipal utilities.

In his reply to the glowing tributes paid him by such dignitaries of the utility busi- ess as Hydro chairman Robert B. Taylor, esident D.J. Gordon and Association of unicipal Electrical Utilities president uce Prentice, Mr. Cousins said that over te years "as a municipal co-operative we ve enjoyed what I believe has been a utually rewarding relationship with all embers of the Hydro family.

"All segments have been both respon- e and responsible in their dealings with e OMEA and municipal utilities.

"But about two years ago, a cloud peared on the horizon when the reports Task Force Hydro began to be released. e OMEA was immediately cast into the ral role of adversary — a role in which I am not at home," Mr. Cousins said.

He added that he is not opposed to change . . . if that change is worthwhile and credible, and will benefit the people of Ontario.

"But, I am opposed to change merely for the sake of change. As president of the OMEA, I can tell you that we do not take kindly to any implication that we, on behalf of our utility members, are being discharged from active partnership in the co-operative.

"This is a change that is, in our opinion, detrimental to the people of Ontario. Input from municipal utilities will be curtailed and established accessibility to decision-making eroded.

"It is my fervent hope that the government will acknowledge the OMEA's concerns and advise us in a positive manner that nothing has changed.

"Then we can move back into that fine working relationship that we had before. Only then can we depart from our unwanted moral role as adversary," Mr. Cousins said.



Mr. Taylor, left, presented him with a gavel, symbolic of his office as president, on behalf of Hydro, and Mr. Prentice, right, presented him with a briefcase from the AMEU.

Preventive medicine act

The Ontario government has introduced sweeping legislation aimed at protecting the environment from potential damage that can result from development projects.

Environment Minister William Newman, introducing the Environmental Assessment Act, told the Legislature it is "preventive medicine" providing a comprehensive system to anticipate and prevent environmental damage that can result from development projects.

The act provides for the assessment of major development projects to avert undesirable effects on the environment at a stage when the proposals can be altered. It ensures that the proponent of a project and the appropriate government agencies conduct a full evaluation of its environmental implications.

Mr. Newman pointed out that the legislation will be implemented in stages, applying first to projects and programs initiated by the government and its agencies and later to major private and public projects.

"An immediate, headlong rush into wholesale application of the legislation to all development projects would be foolish, possibly dangerous — and even irresponsible," Mr. Newman said.

He added that in preparing the new legislation his staff studied all existing assessment systems in other jurisdictions in the world and reviewed a wide range of public submissions which resulted from the publication and distribution of the province's Green Paper on Environmental Assessment.

"Specifically the bill provides that the initiator of a project will prepare an assessment document to meet specifications set out by the Ministry of the Environment which will co-ordinate review of this document.

"In addition the project and its assessment and review may be further examined

by an independent Environmental Assessment Board.

"The board will make its recommendations to the Minister of the Environment. The final decision on the project and the recommendations from all sources pertaining to it will be made by the Minister and the Cabinet.

"Cabinet's decision will be binding so that a project assessed and reviewed will not proceed without meeting the required environmental considerations," Mr. Newman said.

And he added, the new act covers an area of environmental protection which has not yet been fully developed anywhere else in the world.

Slurry pipeline feasible

A Canadian Transportation Commission study has shown that a coal slurry pipeline could compete successfully with railways in the movement of coal from Western Canada to Ontario, via the Lakehead.

Based on rail rates of $9.50 a ton proposed for the movement of coal by unit train to Thunder Bay, and the future increase of these rates, a 24-inch slurry pipeline would produce substantial savings to the Ontario consumer.

The study points out a pipeline transporting 4 million tons of coal a year would save $1.60 a ton over rail and if movement reached 6 million tons the savings would exceed $4 a ton. The maximum possible saving is about $8 a ton over the 25-year economic life of the pipeline.

The study says it is highly probable that enough coal will be contracted for over a sufficiently long time to justify the use of public funds.

A likelihood of coal contracts being signed to produce an attractive return to private investors is not so high, but it is possible in this decade.

A pipeline would be an attractive investment for the private sector if more than 7 million tons of Western coal were contracted for over the life of the pipeline.

Ontario Hydro's requirements for coal for its thermal plants are expected to rise to between 16 and 17 million tons by 1980, of which most is contracted for from U.S. mines for the next 30 years. However, a shortfall of up to 6 or 7 million tons may occur by 1980.

Alberta has vast reserves of coal and Hydro earlier ran test burns of Saskatchewan lignite in a unit at its Thunder Bay generating station.

Meter probe sought

Kingston PUC has asked the federal Department of Consumer and Corporate affairs to launch an investigation into price fixing after receiving five identical bids of $12,475 from separate suppliers for 500 electricity meters.

Commission chairman Robert Fray said he considered it "an insult to my intelligence to think that . . . it's just an accident," after the bids were opened.

A spokesman for one of the bidders has denied there was collusion involving his firm, "because I didn't even know the others were involved."

He said he assumed the other firms did the same as his did. "We just took the list price of a meter out of a book and multiplied by 500. There's your answer," he said.

But, he added, he couldn't understand how the prices at least weren't a few cents different.

Nuclear space-heat

Heat from nuclear generating stations may eventually be used to meet the space-heating requirements of entire communities.

With that objective in mind, the Minis of Energy has commissioned a study b Acres Shawinigan Limited into the feas ity of extracting, storing and distributin heat from nuclear plants without reduc their electrical output at peak periods.

Unlike other studies into the use of waste heat for space-heating purposes this one is aimed at seeking a means o doing so without cutting electrical outp

Hydro, as well as the Ministries of Energy and Housing will be contributin the probe.

Energy Minister Dennis Timbrell say one of the key considerations in this st will be the potential savings in oil and g created by district space heating.

Mr. Timbrell says various sites wher the system could be introduced are no being examined in conjunction with th Ministry of Housing, while European e riences with district heating will also b investigated.

The study is expected to be comple by the end of the year.

Fuel Canister

Construction of the first of two demon tion containers, or canisters, for the st age of spent nuclear fuel has begun a Atomic Energy of Canada Limited's W shell nuclear research establishment, miles northeast of Winnipeg.

Made of 30-inch thick concrete, th eight-feet diameter, 16-feet high canis are mounted on concrete pads. They' being built to test designs which may used in Canada's spent fuel managem program.

Spent fuel from nuclear power stat is now being stored in deep, water-fill bays at the power stations. The metho proven and could provide safe storag spent fuel from power reactors in the nation for many years to come.

However, alternate designs emplo dry storage are being developed so th comparisons to wet storage can be m

The experimental canisters are a fi

tep toward proving out in practical tests a ype of dry storage that would help meet uture requirements and at the same time atisfy the strict criteria of the safety and nvironmental authorities.

The canister concept has been developed to provide a type of storage that will ave a lifetime of at least 50 years and will ermit the contained spent fuel to be trieved, either for transfer to other facilies or for processing. It is not intended as method for permanent disposal of uclear fuel.

The demonstration units will not be filled ith spent fuel. Initially they will be heated ectrically to simulate the heat that would e given off by stored spent fuel. Then they ill be subjected to a series of severe echanical stress tests.

When the design has been approved o more canisters will be built and will be aded with spent reactor fuel to demonrate the safety and reliability of the ethod.

terest renewed

omic Energy of Canada Ltd. says omania has renewed its interest in quiring a Candu nuclear reactor, and nt a seven-man delegation, headed by e deputy minister of electrical energy to nada for two weeks of discussion.

Prior negotiations with the Iron Curtain tion had broken off due to its financial ficulties.

Prices for the 600-MW reactor have calated since then. When first discussed 1969, the estimate was $100 million — it w stands at about $350 million.

Dr. Roy Thomas, head of AECL's marting development department has conned that five other countries — Iran, xico, Denmark, Japan and Ireland — also interested in the Candu system.

Romania may want to buy the design d development work from AECL and dertake manufacture of the reactor lf.

However, Dr. Thomas says, AECL cannot negotiate on behalf of Romania with Canadian manufacturers who have the technology and experience to build Candu reactors. "There are many manufacturers involved, and it's my impression that some would say no.

"Building a nuclear reactor without the proper technological background isn't a safe venture," he added.

Meanwhile, Dr. Edward Teller, the nuclear physicist, says that thorium could be used as an auxiliary fuel in Candu reactors to avert a uranium shortage.

Dr. Teller says thorium could be used in present Candu reactors with "relatively small changes."

Okay, relax

Sixty Ontario residents can breathe easier, thanks to Ontario Hydro's whole body counter, a sophisticated electronic device that measures radiation levels in humans.

The Ontario Ministry of Health rented the counter, the only mobile one of its kind in Canada, to test 60 people suspected of having absorbed radioactive material in their work places sometime during the past 30 years.

None was found to have internal radiation levels above allowable levels.

Earlier in the year the ministry gave preliminary radiation tests to hundreds of people who had worked in dial-painting firms whose quarters had been found to be contaminated.

Where there's a will . . .

One New South Wales, Australia, family used a bellows to operate a vibrating mattress that their quadraplegic mother needed to keep her blood circulating.

A gas station attendant used a bicycle-powered pump to draw gasoline from underground tanks.

And a zoo used emergency generators to make its polar bears their favorite snack of fish frozen in blocks of ice.

The 4.9 million people of Australia's most populous state were learning to live without electricity, an uncertain commodity there since early January when 65 generator repairmen at government power stations went on strike for higher wages.

Blackouts of up to four hours a day were hitting residential areas, and as generators kept breaking down, the government was ordering day-long blackouts in industrial areas. More than 400,000 workers had suffered layoffs and lost an estimated $6.5 million in wages by late January.

A tangle of union jurisdictional and legal problems was expected to prevent a quick settlement of the dispute and government officials in this country of powerful unions were reluctant to force an end to the strike.

Self-sufficiency seen

Federal Energy Minister Donald Macdonald has predicted that the nation should be able to gain an oil surplus position by 1985.

Canada will become a net importer of oil this year.

Mr. Macdonald now believes that Arctic oil will be available in sufficient quantities in Southern Canada by 1985 to offset a substantial oil shortage forecast by the National Energy Board.

This would require completion of a major Arctic oil pipeline — he mentions the possibility of a U.S.-Canadian Mackenzie Valley oil line, paralleling the proposed Mackenzie Valley gas pipeline — by 1985.

The Minister also revealed that Ottawa and Washington are considering developing an oil pipeline along the Mackenzie Valley to link oil resources in Alaska with those being developed in the Canadian Western Arctic.

Science endangered — academic

The federal government has destroyed the future of science in Canada by not devoting enough money to nuclear research, a U.S. academic has charged.

Professor Aaron Segal, of Cornell University, says Canada has lost the majority of its promising nuclear scientists because of a lack of opportunities for them to do research in this nation.

"There are only two nuclear reactors in Canadian universities — both small and weak — and no Canadian university offers a decent graduate program in nuclear physics.

"It's a crime against the future of Canada — suicidal," Prof. Segal says.

Prof. Segal, who has specialized in North American energy problems, told a U.S. commission studying U.S. plans for self-sufficiency in energy that "Canada is a huge power cow capable of keeping both Americans and Canadians energy-content for an indefinite period, if we, together as equals, feed, nourish, and maintain the power cow properly."

municipal briefs

The expanded city of Brampton has requested a common hydro rate to apply across the entire municipality. City council's general committee has said the change should come about as soon as possible. And it has also asked that any restructured hydro system be city-wide rather than region-wide.

Revenue from the sale of Brampton Hydro's works building will be used to lower the debenture debt for construction of a new headquarters building and works facility. The old building is to be purchased by Peel region for future use as a regional water and sewage works yard and headquarters for central Peel.

There was a time not too long ago when London's St. Pierre Construction Ltd. wouldn't have to worry for very long how to get rid of a truckload of used hydro poles — they were almost impossible to come by — new or used. However, the company ran an ad in the paper pointing out it had them from an old Cobalt generating station it had dismantled and they were bought up by Ingersoll, Port Stanley and Wallaceburg utilities for about $1 a foot. "People," says Cecil Hodgins, who has been in the housewrecking business for more than two decades, "will buy pretty near anything."

When Mississauga Hydro lineman Blake McCaig was struck by 13,800 volts of electricity last June, he was not expected to live. But live he did, thanks to fellow linemen, Rod Taber and Norm Neaze, who wasted no time in applying artificial respiration to the victim whose heart had stopped beating. They've been presented with safety awards by the International Brotherhood of Electrical Workers and the Association of Municipal Electrical Utilities. And Mr. McCaig is back in the bucket truck with his buddies.

Veteran St. Marys PUC employees Bill Osgerby and Roy Blanchard have been presented with gold wrist watches for completing a quarter-century of service with the utility.

After 32 years as Aurora Hydro's manager, Charles Copland has decided to call it quits —well sort of. While he has stepped down from the utility's top administrative post, Mr. Copland, 66, has agreed to continue on a consulting basis for a year.

Meter reading has taken a new twist in North York. Water, gas and hydro meters in 90 homes in the borough are being read by telephone in an experimental program designed to test the feasibility of automatic meter reading. The project is a joint venture of North York Hydro, North York Water Works, Consumers' Gas and Bell Canada.

Rockland PUC's secretary-manager since 1968, Giselle Richer, has been appointed vice-chairman of the Ontario Lottery Corporation.

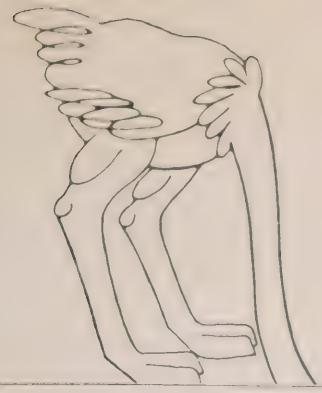
Ontario Hydro has advised municipal u ties that effective April 1, there will be a fee for each residential heating-cooling load calculation done by Hydro. G.K.F. Pepper, Hydro's manager of customer applications, says the charge is being implemented to encourage a more dire involvement on the part of the private s tor in industry for quality control and ef ciency in electric space conditioning systems.

Toronto Hydro workers have accepted 36.8 per cent pay increase over two ye to end a two-week strike. The pact call a 21 per cent increase retroactive to F ruary 1 and another 4 per cent July 1. the second year there will be an 8 per hike February 1 and an additional 3.8 cent takes effect April 1. A cost-of-livir increase providing a 1 1/2 per cent pa boost for every nine point rise in the C sumer Price Index has been awarded.

Sudbury Hydro has ordered a 10 per c cutback in gasoline consumption by employees using commission vehicle Commissioner Ted Dash suggested th the utility should be practising what it preaches when it attempts to encoura conservation.

An Oakville PUC customer service re sentative, Bill Coakley, a one-time sal representative, is spreading the good about energy conservation. Mr. Coak has been touring schools, service clu women's groups and the like telling p how they can save energy — and dol

Waterloo Hydro wants appliance man turers to list electric energy consump rates on their products so that consu can shop around to conserve energy resolution passed at a recent commis meeting calls on the federal and prov governments to demand that informa plates be added to new appliances.



as don wright sees it

Time in lieu means different things to different people depending upon how the last word is spelled. The version above is straightforward enough and generally refers to time off from the job granted at a later date in return for extra work performed now.

Time in loo is something only the Englishman will understand — referring as it does to those dedicated moments he spends each day in pursuit of relief from his personal environmental problems. The loo, of course, is the British equivalent of our john or, more specifically, those gurgling china gargoyles upon which all nationalities are inclined to sit and cogitate on the discharge of their duties.

But the state of toilet technology is not equally advanced even among developed countries.

The Canadian lavatory cistern and associated mechanism is so efficient that users are inclined to take it for granted like the electrical system that serves the province. Action is expected with each tug of the chain.

Less so the lowly loo. Silence is all that greets the British summons six tugs out of 10.

But the British are a proud lot and don't intend to bring up the rear in the matter of water closets.

Efforts are now underway to improve the reliability factor and through basic research and development to bring forth such a lulu of a loo as to re-establish Britannia as the ruler of the waves — albeit on more confined scale than was enjoyed in the days of Sir Francis Drake.

Backed by a grant of 6,500 pounds from the Department of the Environment, the Institute of Consumer Ergonomics is moving quickly to put Britons back on the kind of throne the world can admire. And judging by a report in the New Scientist, they aren't just fooling around with aesthetics and superficial adornments.

Step one in the program involved the hiring of 166 volunteers, for three quid each, who were willing to be photographed on a lavoratory seat — in three different positions!

Unfortunately, the magazine item fails to identify the three positions but the mind boggles at the implications. Perhaps there are other things that can be done on the john without wasting time waiting for nature to take its course.

Or are they thinking in terms of fully reclining bucket seats? This would greatly ease operator fatigue particularly for persons who are frequently on the move.

It's a well directed bit of research, no butts about it, and may their efforts be flushed with success. Or will they meet their Waterloo?

■ Not that we are entirely free of toilet trouble on this side of the water. The lack of public toilets and the closing of restrooms has been pinpointed by some researchers as an important factor behind the downfall of core areas in major U.S. cities. The rising crime rate is another.

If these downtown areas are to be saved, then, a double-barreled approach seems to be called for. They'll have to fight both lawlessness and loolessness.

And there is that bill introduced recently by a U.S. congressman which would ban pay toilets throughout the nation. We don't have his name but it's a safe bet he was caught short without a dime to it.

■ Here in Canada the construction industry suffered an acute shortage of toilets last year to the point where house building was adversely affected. According to the Daily Commercial News, the situation got so bad that builders were going to the United States for relief.

That's a long way to go when you need a toilet in a hurry.

■ Hydro won't be helping the situation if it doesn't keep a sharp eye on the limestone processes it is testing for scrubbing sulphur dioxide from its smokestacks. One type of limestone was found unsuitable because it reacted with sulphur to produce magnesium sulphate.

Better known as the laxative epsom salts, this was seen as creating a formidable disposal problem either collectively or individually. Leaking into the water supply it could affect the movements of millions.

■ Funny how we can work ourselves into a tizzy over problems that will solve themselves very nicely in the fullness of time. Energy conservation is a case in point.

Many of us have been worrying over dwindling oil and coal reserves on the mistaken premise that these are non-renewable resources. This just isn't so, of course, and as one helpful observer has pointed out, the processes which established these important sources of energy are still working away full blast.

He theorizes that the trees and plants of today will provide tomorrow's coal if we can hang in there for 1,000 million years. If we're in a hurry and would settle for oil the supply should be replenished within 250 million years.

We'll all be pretty long in the tooth by then, of course, and who knows what they'll be charging if the present rate of inflation continues.

■ And there is good news on the heavy water front where potential new markets are opening up for a commodity whose usefulness up to now has been pretty well confined to the production of nuclear electric power.

Scientists have discovered that heavy water is the best possible ingredient you can mix with your scotch. As it comes through to us, alcohol and heavy water have exactly opposing effects on the human physiology so that if you down your scotch with the right amount of heavy water — nothing happens. One cancels out the other so that dizziness and hangovers are eliminated.

One drawback is cost. Scotch is expensive enough and the heavy water antidote is even more so. People may be unwilling to pay so much for exactly zilch.

■ We are in complete sympathy with those people who have expressed alarm at the latest liquor statistics for Canada. These show that more than 2.77 million tons of grain were used during the last three years for the manufacture of beer and liquor. The rest was probably wasted.

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the cover

Straining every muscle, young athlete crosses finish line on Burlington track rebuilt with cinder-like bottom ash from Lakeview generating station. See articles beginning on Page 2.

Cover Photo: Harry Wilson

hydro news, volume 62, number 4

Published by Ontario Hydro, 620 University Ave., Toronto.

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Printed in Canada.

_ooking for guidelines

A decade and more will elapse from the me a decision is made to proceed with a ew generating station until first power is ed into the provincial electrical grid. A lot f things will change during that 10 to 12- ear period and that is why load forecast- ıg is so difficult and important. Having the ıcilities available as they are needed is the ame of the game.

Overbuild and the penalty may be igher costs, more environmental degrada- on and reduced financial viability.

Err in the other direction and the results ould be even more damaging. Unsatisfac- ory service and the inability to meet the lectrical needs of the economy are situa- ons Hydro wants very much to avoid.

These and other problems fundamental the future of electrical supply in the rovince will be put before the public in the ıonths ahead. Hearings before the ntario Energy Board into Hydro's pro- osed rate increases for 1976 are now nder way. They will be followed later in ıe year by the Commission of Enquiry into ıe Long Range Planning of Ontario's ower Needs.

The rate at which the demand for elec- icity grows, of course, will affect the xtent of Hydro's multi-billion dollar expan- on program. This will eventually influence osts and the rates people pay for electric- y.

In its long-range planning report, Hydro as suggested various rates of growth hich might materialize together with the nd of facilities required to meet them. It onsiders the historical average annual owth rate of about 7 per cent as the most kely to occur over the next 10 to 20 years — king into consideration such variables as conomic conditions, population growth, e availability and cost of other forms of ıergy and the effects of conservation.

Quality of supply is the other main factor etermining the need for new facilities. his involves establishing the right amount f reserve generation to build into the sys- m from the points of view of cost and reli- ility of service.

Hydro is hoping the public hearings will provide guidelines in determining the appropriate quality of service and help to answer a host of related questions. It will also be seeking recommendations as to how the views of the government and the public at large can best be included in planning and implementing changes to the electric power system, particularly where trade-offs are required and Hydro's traditional responsibilities have been challenged.

Energy conservation is a case in point. Should Hydro be doing more to encourage the voluntary conservation of energy? If so, what are its responsibilities and how do they fit in with those of other agencies?

Or should there be mandatory restrictions on the use of energy? What should they be and who should impose them?

And there is the question of rates. The present rate structure is intended to provide an equitable distribution of costs among the various classes of customers. Should this principle be set aside in favor of a schedule designed to reduce energy consumption ?

Environmental costs and the whole process of public involvement in Hydro planning are other areas sprouting their own healthy crop of question marks.

In a preliminary report to the commission on long range planning, chaired by Dr. Arthur Porter, Hydro sets out these and other specific questions and subjects for which it hopes the commission of enquiry will provide guidelines.

"Such guidelines will require complex trade-offs among various community concerns and values," the report observes. "It would be of great assistance to Ontario Hydro to receive the recommendations of the commission as to the proper role to be played by government and the general public in making their views known to Ontario Hydro in a timely manner, so that such views can be reflected in the planning process."

And in announcing the appointment of Dr. Porter as chairman of the commission of enquiry the Provincial Secretary for Resources Development stated that the commission would focus on the broad concepts of alternative ways of supplying electric power as well as examining the more technical aspects. He said, in part:

"The public needs to know what demands for electricity will be placed upon Ontario Hydro in the long term, how these needs should be met and what impact this would have on Ontario's way of life and its physical environment."

It's a challenging assignment and an exercise in public participation of unprecedented scope. Trade-offs will be involved and no simple answers can be expected to questions of such complexity involving so many unknowns.

No modus operandi for Hydro will be entirely satisfactory to people of such divergent interests as will be represented at the hearings. Hopefully, the sifting of a great deal of information and the introduction of fresh viewpoints will result in policies that are acceptable to the majority and are in the best interests of the people Hydro is seeking to serve. □

Cinderella Story

Once considered a public nuisan
fly ash is gaining acceptance as an as

by Bob Morrow

Ten years ago an Ontario Hydro stalw
named "Fly Ash Charlie" used a helic
to hunt for abandoned pits and quarri
dump the fine, grey residue of coal-fi
stations.

Charlie has since retired and 10 m
with Eric Dalrymple, Hydro's ash utili
engineer, convinces you that those d
are gone forever. In the new era of re
cling, Hydro foresees the tantalizing
spect of turning all its ash into an ass
instead of a liability if quality control a
marketing problems can be solved.



Fly ash, long considered a public nuisance, is slowly gaining recognition for its value. Last year, in fact, the state of Maryland passed legislation declaring fly ash to be a natural resource.

"The public's concern about the quality of the environment and energy conservation are forcing up the prices of conventional materials like sand and gravel. This presents Hydro with a classic opportunity to sell fly ash, avoid dumping and promote recycling of waste materials," says Mr. Dalrymple.

Composed mainly of silicon, aluminum and iron oxides, fly ash can be used in making concrete, concrete block and pipe, bricks, mineral wool and possibly insulating board.

It contains iron oxides and carbon that could be used in sewage and water treatment plants to remove pollutants. Another possibility: the iron particles could be smelted to produce pig iron for making castings.

As if that weren't enough, new uses for this Cinderella material keep surfacing all the time. The Royal Navy found a way to use the tiny glass spheres found in some types of fly ash to make aerials for its submarines (see Mystery of the Spheres).

Many tons of Hydro's fly ash have been used in the concrete industry in Metro Toronto. The top six floors of the Harbour Square hotel-condominium development at the foot of Yonge street contain cost-saving lightweight concrete made from Lakeview generating station ash sintered into aggregate. Fly ash, beneficiated by an air separation process and known as pozzolan, has also been used as a partial replacement for $35-a-ton Portland cement in the Royal Bank tower and for the TTC subway tunnel between Finch and Sheppard avenues, and in the concrete blocks for the extension to the W.P. Dobson research laboratory in Etobicoke.

Hopper located at base of 490-foot stack holds fly ash captured by electrostatic precipitators at coal-fired Lakeview generating station. Fly ash has growing potential for recycling.

But let's not forget the cinder-like bottom ash. Two running tracks were recently repaired and resurfaced at Burlington with bottom ash taken from Lakeview furnaces (see Bottom's Up!). That's significant enough to make a man with a king-size disposal and marketing headache dance a jig, save for the sobering thought that bottom ash has greater potential. It is being used in the U.S. as a granular base in building airport runways, parking lots and highways.

Lennox, Hydro's first oil-fired station, has created the most valuable recycling opportunity so far. Last fall Union Carbide Corporation was the successful bidder for a five-year contract to buy Lennox's fly and bottom ash for its vanadium content, thus eliminating a site disposal problem there. All the ash will be shipped to processing plants in 45-gallon drums.

Depending on the vanadium content found in the ash in the form of vanadium pentoxide, the contract may ultimately be worth $2.5 million to Hydro. Added to steel, vanadium produces tough alloys for axles, piston rods and crankshafts.

Hydro captures about 1 million tons of fly ash annually at its six coal-fired stations. Five years from now this figure could climb to 1.6 million tons. It costs from 50 cents to $2 a ton for disposal, so any savings would be welcomed by everybody who uses electricity.

Why does Hydro have so much? The fly ash is trapped before reaching the chimneys by electrostatic precipitators designed for 99.5 per cent efficiency to avert pollution.

Hydro has been developing various uses of fly ash since 1949. Some has been used to make concrete products or as landfill to create parks and recreation areas in Mississauga and Windsor. But most of the ash must either be dumped in hard-to-locate gravel pits or in station disposal areas.

What to do about ash is a problem facing all coal- and oil-fired facilities (although much less ash comes from oil), and possible solutions are emerging. The trouble is that the Cinderella material needs a fairy godmother to waft away the difficulties, but no one has a handy magic wand.

Fly ash concrete blocks destined for new wing of Ontario Hydro's research laboratory in Etobicoke are inspected by Eric Dalrymple, ash utilization engineer.



In a co-operative research project with General Concrete Limited of Hamilton, fly ash has been processed into two products useful in the concrete industry at Ontario Hydro's $1.5 million pilot processing plant located near Lakeview station on the western outskirts of Metro Toronto. This is pozzolan — refined fly ash that can replace up to 30 per cent of the Portland cement used in making concrete — and lightweight aggregate.

The Lakeview plant was commissioned in 1972. Since then Hydro has made a modest penetration of the Metro Toronto concrete market and several thousand tons of Lakeview's products were sold in 1974.

General Concrete has been using the processed fly ash in a number of products, including concrete blocks, pre-assembled roof and floor slabs. Under development by the company are pre-assembled wall panels.

The lightweight aggregates permit the production of lightweight, strong concrete capable of spanning greater distances between supports. These lighter, longer spans can be more easily erected, reducing costs for foundations, reinforcing steel and formwork. They are now used extensively in apartments and other high-rise buildings in the Toronto area.

But the Lakeview operation has been beset with difficulties that might be expected in a pilot plant, plus the knotty problem of variable carbon content in the fly ash. Several ways of unravelling the knot are being pursued.

Carbon absorbs moisture and reagents used in making air-entrained concrete, reducing their effectiveness and making control difficult.

Canadian Standards Association specifications limit carbon content to 12 per cent, and Hydro's experience indicates 7 per cent is desirable for air-entrained concrete, the type that's used for cladding modern buildings.

Perplexingly, Lakeview carbon content has varied up to 20 per cent. Although there are many variables, the main one appears to be the loading of Lakeview coal-fired units to meet fluctuating power demands as part of Hydro's generating mix.

With nuclear power and some hydroelectric stations supplying base load, and coal costs rising steeply, coal-fired stations are used selectively in meeting demands. For example, a Lakeview unit may be idling during the night and going full blast during the day. During the night carbon content will be too high for air-entrained concrete but quite acceptable during the day.

The varying carbon content also causes extreme difficulties in making aggregate. For this reason the Lakeview sintering operation has been shut down since last August, although the plant continues to produce pozzolan by air separation.

Variable carbon content has been vexing, too, because Hydro has been forced to import ash of consistent quality from Detroit Edison as a partial replacement for cement in new generating stations. In a recent breakthrough, however, Hydro sold 400 tons of Lakeview pozzolan to a firm that has the ready-mix contract for Pickering B nuclear station. Over the next few years about 8,500 tons of beneficiated ash are expected to be used to build Pickering's twin.

One line of attack on carbon has been to seek methods of improving combustion efficiency by fine tuning boilers (see A Big Sniff Helps Clear the Air, Hydro News, March/April). But other methods of carbon removal are under active study.

The Ontario Research Foundation has been experimenting with a flotation process adapted from mining technology to remove carbon, while researchers at the University of Western Ontario are investigating an electrostatic separation process for carbon-rich ash. The Western technique involves percolating air through a porous bed, causing ash particles to rub together and pick up opposite electric charges. A good percentage of the carbon has then been removed by electrostatic attraction.

Other thorny problems are the slow market acceptance of an unknown product and cyclical output. Fly ash production sags each spring — partly because hydroelectric stations are running full tilt during the annual runoff — and just when demand for construction takes off toward its summer peak. Hydro has developed plans for an inexpensive shelter to store beneficiated ash to ensure continuity of supply in these periods.

An in-depth marketing survey indicates that if such problems can be overcome Hydro could sell as much as 1.6 million tons of fly ash by 1984 to the concrete industry alone for making air-entrained and non-air-entrained concrete, ready-mix concrete, concrete pipe and concrete block.

Iron oxides extracted from fly ash could be used as coagulant in water and sewage treatment plants, and a waste management firm is interested in mixing the cementitious raw ash with chemical wastes and discharging the mixture into a pit.

Other possibilities are being explored at the Universities of Toronto and Guelph. A U of T group has succeeded in turning the 8 per cent magnetic iron oxide content into pig iron in an electric arc furnace. Meanwhile, Dr. Edward Watkins, a Guelph University research scientist, plans to use 100 tons of Lakeview ash as a possible neutralizing agent for acid wastes at mine disposal sites in northwestern Quebec — a land reclamation technique that has sh promise in the U.S.

Aside from these uses, fly ash com into focus as a potentially many-facete resource when it's chemically analyze Fly ash varies with the source of coal h typical Lakeview samples contain oxic silicon (43.6 per cent), aluminum (18 p cent) and iron (15 per cent), varying amounts of carbon and smaller fractic calcium, magnesium, potassium, sodi sulphur and titanium.

The feasibility of separating useful ponents hinges on economic incentiv and technical developments but in a v concerned about diminishing resourc many researchers are taking a hard lc them.

Gerry Clendenning, a concrete spe ist in Hydro's research division who h studied fly ash for many years, says o the highest potentials for fly ash use involves the adsorption characteristic its carbon. Ontario Research Founda tests show that carbon removed from ash — ironically, the same element w variation causes problems in making entrained concrete — has 75 per cer the adsorption qualities of activated c bon. And commercially-produced act carbon sells for about $500 a ton!

"Carbon-rich ash could be used ir ary sewage treatment to remove pho phates or chemicals that pollute wate says Mr. Clendenning, "but unfortun these systems are as yet undevelope

Eric Dalrymple, who headed a rec Hydro task force study, points out tha ain uses more that 60 per cent of its f for useful purposes and argues that t dian and U.S. attitudes of regarding i waste must change. "The key has gc its utilization as a resource."

Mystery of the spheres

It's a mystery why tiny glass microballoons called cenospheres are formed in some types of fly ash.

Ontario Hydro researchers would certainly like to know because cenospheres have great potential for recycling. Manufactured glass spheres, a common industrial product used for reflective surfaces and insulation, sell for $10 a pound.

"We don't know what conditions produce cenospheres," says Gerry Clendenning of Hydro's research division. "You find them only at certain coal-fired generating stations in Britain and the U.S., where they float to the surface of fly ash lagoons."

Only a few have been found on Hydro's single fly ash lagoon at Nanticoke generating station on Lake Erie. "Our ash has no value in this connection," he says.

It's a pity. Some power stations find that the volume of cenospheres makes up to 20 per cent of their total fly ash. These "floaters," as they are sometimes called, are skimmed off storage lagoons and sold. A British firm plants special grass seed on a floating layer of them, rolls up the sod, and sells it for putting greens.

The hollow glass spheres have been mixed with resin to form synthetic foam for use as buoyancy material in submersible vessels for exploring the ocean depths.



Fly ash particles, magnified 80 times (top) and 800 times (bottom), are revealed as tiny glass spheres with many potential uses.

Researchers at Washington State University have used cenospheres with a bonding agent to produce a new, lightweight, fireproof material, which will not burn at 1,000 degrees C. Its developers believe the material can be economically substituted for plastic in the manufacture of insulating board, ceiling and wall tile, trims and mouldings.

Aerials of Royal Navy submarines have been made with a syntactic foam composed of cenospheres mixed with epoxy resin and hardener that can be shaped by casting or machining. A British utility says the resulting material is inexpensive, strong, waterproof, transparent to radio waves, and functions as well, if not better, than an all-metal aerial.

Hydro hasn't given up looking for cenospheres. Mr. Clendenning speculates that they may be found in a few years when Hydro starts burning large quantities of coal from the Canadian West as well as the U.S.

You never know what use will be made of cenospheres in the future. Similar man-made microballoons — so tiny that two billion will fit into a jam jar and so light they float in the air — were used in a successful 1974 laser-fusion experiment by KMS Industries, a small Michigan research firm.

The glass spheres were heated until they became permeable, filled under pressure with deuterium and tritium gas, zapped with a relatively low-powered laser beam, and voila! KMS achieved a significant release of energy that made high-powered plasma physicists sit up and take notice.

Bottom's up!

"Cinders are as scarce as gold dust."

At least, that's what Bill Johnson used to think before he phoned Ontario Hydro's ash utilization team. To his delight, not to mention Hydro's, he found that the bottom ash from Lakeview generating station was ideal for repairing and restoring two cinder running tracks in Burlington.

"We would have been in a bind if we couldn't have found Hydro bottom ash," said Bill, who is district foreman of the Burlington Department of Recreation Services parks unit. "It's doing a beautiful job and I'm really impressed with it."

Bill, who used to run professionally, explained that he likes cinders because they are more resilient than stones and cause less wear and tear on track shoe spikes. Besides, maintenance on cinder tracks is "almost zero."

But he almost gave up trying to find any. A dozen phone calls were futile and the builder of one of the Burlington tracks told him that he, too, was stumped. Then Bill phoned a friend at Hydro.

Soon after, Bill Johnson was supervising the grading and rolling of five-ton truck loads of Hydro's cinder-like bottom ash on intensively-used running tracks at Nelson Stadium and Lord Elgin High School.

In the first sale of its kind, Hydro sold about 150 tons of bottom ash for $1.50 a ton (FOB Lakeview) and, what's more, saved $1.45 a ton in dumping charges. Bottom ash, equivalent to granular "B" aggregate, is now being stockpiled at Lakeview for a number of potential uses.

About 10 per cent of the residue from Hydro's coal-fired generating stations consists of bottom ash, which has been mixed with bitumen in the U.S. for anti-skid surfacing of roads and parking lots. It's also used there to fill potholes, as sand-blasting grit, as fill, as ballast for railroad tracks and as roofing granules.

Bill Johnson says the Burlington parks unit is seriously considering roto-tilling bottom ash into clay to improve drainage during initial development of new parks and using it as backfill around drainage tile.

As for tracks built up with bottom ash, Bill says he is tempted to start running again.

Bill Johnson, district foreman of Burlington parks unit, explains how cinder-like bottom ash from Lakeview station has been used to resurface Nelson Stadium running track. After lanes were marked, young athletes competed in Burlington invitational relay.





Powdery Potpourri



Fly ash obtained from burning western U.S. coal is, strangely enough, a potential source of uranium.

A Brookhaven National Laboratory study, conducted for the former U.S. Atomic Energy Commission, notes the possibility of a shortage of low-cost uranium toward the year 2000 if breeder reactors do not become commercially successful. Uranium supplies might be extended by reclaiming uranium from fly ash produced at large, western-based coal-fired power stations.

Brookhaven estimates there may be as much as 21.9 million tons of recoverable uranium oxide (U_3O_8) in sub-bituminous and lignite coal deposits in North Dakota, Montana, Wyoming, and Alaska.

○ ○ ○

The U.S. produces 50 million tons of fly ash a year, vaulting coal ash into seventh position among solid minerals. The U.S. Department of the Interior ranks ash behind sand-gravel, stone, coal, iron, Portland cement and clays.

Alumina found in fly ash has been suggested as a substitute for bauxite in making aluminum. This option has begun to look better because small countries that export bauxite have taken a leaf from the Arabs' book and formed a cartel to force up prices.

In Germany, alumina is extracted from fly ash to make powdered anti-perspirants.

○ ○ ○

Natural pozzolans have been used for more than 2,000 years. In a Roman aqueduct started in 312 B.C., stones were laid with a mortar made of lime and a volcanic ash found near the town of Pozzuoli. This typical building material of the Romans can still be found intact in many of the historical remnants of their civilization. Volcanic ash and limestone were the basic cementing materials until Portland cement was developed in 1824.

○ ○ ○

International Brick and Tile Ltd., of Edmonton, constructed a plant to manufacture brick, block and tile from fly ash. The ash comes from Calgary Power Ltd.'s nearby coal-fired station in Wabamun, Alta.

○ ○ ○

Ferro Boat Builders, Inc., of Edgewater, Maryland, uses fly ash in making pleasure and fishing boats up to 50 feet long. The fly ash is mixed with cement and applied over four to 12 layers of wire mesh.

Kent Guida, vice-president and research director, says: "We foresee the time when ferro-cement will be utilized for fishing fleets, coastal steamers, pleasure boats of all sizes, modular housing units and all kinds of prefabricated self-contained units — pedestrian bridges, holding tanks, and sewage systems."

○ ○ ○

Britain leads the world in making use of fly ash, thanks to intensive promotion by the Central Electricity Generating Board.

About 2.5 million tons of pulverized fuel ash, or PFA as it's known there, are used annually as load-bearing fill for motorways. Fly ash embankments up to 26 feet high have been built and camouflaged with grass.

Tongue in cheek, the CEGB publication Power News has even suggested mixing PFA with tea! □

REKINDLING COAL





by Bill Settatree

Every week a 90-car unit train leaves Corbin, British Columbia, loaded with coal destined for delivery to Ontario Hydro at Thunder Bay, about 1,300 miles away.

Corbin, located just west of the Alberta border in the Crowsnest Pass area of the Rockies, is a community in name only. There are no streets, no modern homes and no businesses, no telephones or electricity. All that remains of what was once a thriving mining town is an old railway roadbed, a few caved-in basements, some run-down sheds and one small house.

The population is one, an elderly man who decided to get away from it all and moved there a few years ago. Coal mining died at Corbin during the depression and the town has existed merely as a spot on the map ever since.

That was until Byron Creek Collieries Limited took over the property last year, moved in new stripping equipment and began mining the first of an estimated 200,000 tons of medium volatile bituminuous coal for shipment to Hydro this year. The contract could be increased to at least 500,000 tons a year, about two-thirds of the mine's annual capacity.

But this is a drop in the bucket in relation to Hydro's 1975 requirements of more than 8 million tons. The 200,000 tons represent enough to keep the eight-unit Nanticoke generating station operating at full capacity for only five-and-a-half days. Coal-fired plants now account for 45 per cent of Hydro's total generating capacity.

The work force at Corbin is about 100, commuting to the minesite from either Blairmore, Alberta, or Fernie, B.C., both about 20 miles away. Corbin's only resident has a part-time job as watchman at the mine.

Corbin will likely remain a ghost town because there is no current plan to rebuild it, but the mine on nearby Coal Mountain stands as a symbol of the rebirth of the coal industry in the west.

Although small, the contract with Hydro represents the first firm deliveries of western coal to the Ontario utility. Other deals are pending. Plans are to increase the purchases from the west to a minimum of 3 million tons by 1978 and perhaps double that amount a few years later.

One of the problems that could have an effect on the resurgence is manpower. The Coal Association of Canada estimates the present work force of about 2,000 employed by the industry in Alberta a British Columbia will have to swell to a 9,000 in the next seven years to run al new mines expected to open up. Som long-established companies like Cole Collieries have had permanent "help wanted" signs out for years.

As well, the Coal Association is co operating with both the University of Columbia and the University of Albert establish courses which will graduate cialists in all aspects of coal mining – such as engineers and geologists.

Gordon Smith, vice-president—ma for Byron Creek Collieries Limited, is mistic.

"There's lots of exploration activit the economic prospects for coal look much brighter than they did a few yea ago. When the railways went out of s many of the smaller coal companies out. But now shortages of oil and nat gas are making this product more att tive."

Each 90-car train from Corbin car about 7,000 tons of coal to Thunder lake shipments to the generating sta Mr. Smith describes this arrangemen Hydro as basically a test program an

Hydro's needs revitalize western mining activities

Overburden is being removed and coal loaded at Coal Mountain mine near Corbin, British Columbia (far left). It's then transported by 90-car unit train to Thunder Bay, 1,300 miles east. A stacker-reclaimer then unloads the coal at the terminal for shipment to other destinations by boat. At right, ship is loaded at a Vancouver terminal using facilities similar to those which will be built at Thunder Bay.





ther negotiations are under way. He feels Ontario Hydro will be his company's biggest single customer although he recognizes that Hydro must look to other sources of supply.

"They couldn't put all their eggs in one basket because of the possibilities of strikes or other problems. They must have versatility in supply," he said.

That is a main reason why Hydro began looking westward a few years ago.

Ted Bazeley, Hydro's senior fuel resources engineer, explains that increasing demand for fossil fuels and concern over whether U.S. coal production will be able to keep pace with the expected rapid increase in U.S. domestic demand are behind Hydro's decision to explore Canadian markets.

Hydro's needs of 8 million tons of coal this year are expected to double over the next five years.

Mr. Bazeley says Hydro at present obtains all its coal from the eastern U.S. where there were serious coal shortages last year. Relaxation of U.S. air quality standards and reconversion of U.S. utilities to coal, as announced by President Gerald Ford, brings a likelihood of further shortages.

On May 7, Frank Zarb, U.S. federal energy administrator, announced that nine utilities in the middle west had been notified of the government's intention to order them to burn coal instead of natural gas. Affected are 25 generating units at 12 stations. Several east coast utilities are also expected to be similarly notified. In all, up to 70 plants may be involved.

Just when the conversions will take place is anyone's guess. Utilities are expected to challenge the orders on the grounds that they cannot get enough coal at reasonable prices or that the coal does not meet environmental standards or technical requirements of the plants.

The U.S. situation, plus the fact that in 1974 Hydro entered into a 30-year contract with United States Steel Corporation to buy the entire output of a new Pennsylvania mine, led to Hydro's decision to diversify its supply sources by obtaining a portion of its increasing load requirements from western Canada. Under the Pennsylvania contract, an estimated 90 million tons of coal will be shipped to Ontario. But when the full yearly quota of 3 million tons is reached in 1979, it will represent about one-sixth of Hydro's coal requirements.

In addition to the Byron Creek arrangement, Hydro has negotiated one major agreement with Luscar Limited of Edmonton. The Luscar terms call for delivery of up to 2 million tons a year of bituminous coal, with deliveries to begin in 1977. The only holdup is securing approval from the Alberta government for open pit mining to start.

The mine will be established in the Coal Valley area of Alberta west of Edmonton, southwest of Edson and east of Jasper Park.

The first recorded discovery of coal from this region was made around the turn of the century.

In 1911, development of underground mines was started, coinciding with the completion of the Grand Trunk Pacific and Canadian Northern railways, which were amalgamated as the Canadian National Railways in 1917. New sources of coal were needed for the railways and coal mining in the area flourished, reaching a peak in the 1940s.

During this period, about 16,500 people lived in mining communities throughout the area.

But following the Second World War the

Mining at Coal Valley, Alberta, (far left) first boomed as railways were being built across the west. An old miner's shack in the area is still in use, but not the Y-yard Shay locomotive seen in operation at Corbin No. 3 pit in the 1920s, around the same time that rail cars are shown being loaded at the Corbin site.





diesel locomotive took over and spelled the beginning of the end for the area. Population eventually dwindled to 500.

What were once thriving mining towns became ghost towns, much like Corbin. The Luscar property, which was acquired from the Sterling-Coal Valley Mining Company Limited in 1970, is such a site. Abandoned mining pits nearby characterize the area. But, unlike the Corbin project, the Luscar company plans to reactivate a community with housing to accommodate a staff of 225 or more.

George Coates, senior vice-president of Luscar, says delays in formalizing the arrangement with Hydro reflect the time required to formulate a new provincial coal policy and the Alberta government's sensitivity to public concerns.

"The government has adopted a policy of public participation and has been holding hearings in connection with land use on the eastern slopes of the Rockies where coking and bituminuous steam coal deposits are located."

Luscar's property would serve Hydro almost exclusively at first, but the company is investigating markets in Japan and elsewhere. If all goes well, the first shipments to Ontario will begin in mid-1977.

Mr. Coates looks at the Canadian coal situation this way:

"We in Alberta are very conscious of the extent to which Canada imports coal. Of all the countries in the world Canada is the second biggest importer, next to Japan. This is really an anomaly when you consider we are sitting on billions of tons of coal right here."

Numerous problems are associated with the western Canada coal purchases, not the least of which is transportation.

Hydro will have to enter into leases for the operation of unit trains to run continually between the various mines and Thunder Bay. A major terminal facility, costing in excess of $30 million, is being built there by Thunder Bay Terminals Limited, a subsidiary of Federal Industries Limited.

The terminal will have the capacity to handle about 6 million tons of coal per year, storing what is not shipped by boat during the winter months. Hydro will also have to contract for lake freighters to get the coal from the terminal to its generating stations.

The terminal is being built on McKellar Island, at the mouth of the Kaministikwia.

Gus Leach, of Winnipeg, president
Thunder Bay Terminals, says the proje
running behind schedule because of t
delay in establishing Alberta's coal pol
However, he is optimistic that the bala
of construction will be in full swing bef
the end of this year.

The Thunder Bay operation will inc
rate proven engineering concepts and
equipment, says Mr. Leach. Its main fe
tures will include a semi-automatic ca
indexer, rotary car dumper, a stacker-
reclaimer and ship loaders.

A fully-loaded unit train will be dum
within six hours.

Unit trains operating over both CP
CN lines will require about a week to
a round trip from the mines to the ter
and back again — a total distance of
than 2,600 miles. Plans call for six tra
be used initially.

Docking facilities for ships at McKe
Island will consist of slip berths cut int
terminal site. Berths and approaches
be dredged to a minimum of 30 feet.

The entire 250-acre terminal facilit
be provided with various forms of dus
trol and suppression devices.

Aside from its service to Hydro and





other coal users, the new terminal will likely be expanded to handle other bulk commodities from the west, such as potash and uranium, says Mr. Leach.

Another problem is how best to burn western coal in Hydro plants.

The western coals tend to be low in sulphur content and although this is normally an environmental asset, it can have a detrimental effect on fly ash precipitator performance.

A number of tests are being undertaken using mixtures of western and U.S. coals, since in many cases of this kind more optimum results can be obtained by blending with other coals.

The lower volatile content of some of the western coal could affect flame stability as well, but again, mixing it with higher volatile Canadian or U.S. coal could ease this situation.

Mr. Bazeley says some western coal, especially that from the Alberta plains regions, has a low grindability index which could put a strain on station pulverizers.

Although Ontario Hydro is expected to be the biggest single customer for western coal, a substantial amount will likely be shipped to Ontario for steel-making in the next few years. Again, the Thunder Bay terminal will be used as the drop off point between rail and water.

Metallurgical coal differs from the steam coal being purchased by Hydro. It has good coking properties and is usually found in the mountain regions. Some of the Corbin coal could be suitable for steelmaking.

Mr. Bazeley explains that the steam coal which Hydro is buying from the west is classed as bituminous C coal, compared to bituminous B which it receives from the U.S. The lower the rating of coal, the lower its heat-producing value.

The next lower-rated coal to that which Hydro is purchasing is sub-bituminous, which is found in the plains regions of Alberta. Lignite, which Hydro plans to use in the two new 150-megawatt units at Thunder Bay, has an even lower heat value than sub-bituminous coals. Lignite produces about 7,200 BTUs per pound while the Alberta bituminous coal produces about 10,900 BTUs per pound.

Lignite was tested by Hydro in 1970 and is used extensively in Saskatchewan power plants because of its ready availability. Its main drawback as far as Ontario is concerned is its water content — as much as 34 per cent of total weight, compared with 4 to 6 per cent in bituminous coal. The water thus adds to transportation costs.

Elsewhere, small quantities of Nova Scotia coal may become available when a new mine is opened by the Cape Breton Development Corporation.

While maintaining and somewhat expanding the present U.S. coal supply base, Ontario Hydro is actively pursuing a policy of diversification which is aimed at developing sources in Canada.

Such a program of diversification permits Hydro to take advantage of the unique characteristics of both supply sources. □

Plotting to improve rights-of-way

Apartment-dweller Gayle Hulme likes to grow vegetables. So in summer evenings after work, she doesn't mind driving several blocks to tend her garden — on a Hydro right-of-way.

Gayle is one of hundreds of Metropolitan Toronto residents who take advantage of a program in which garden plots are established for public use along specially-fenced areas of rights-of-way.

It's all part of Hydro's desire that rights-of-way should have multiple uses. Under the policy, established in 1973, Hydro makes portions of its rights-of-way available to municipalities for $1 a year for parks purposes. The garden plots are just one use which municipalities are finding for the land. Recreational activities are also provided in some areas.

Before 1973 Hydro leased land for parks purposes but required shorter leases and higher rents to offset part of the taxes.

All Hydro asks for now is access to transmission towers for repairs and maintenance and provision of anti-climbing barriers and other safety features which are provided at Hydro expense.

Rights-of-way are being used for surface transit, parking, golf courses and other activities. The garden plots are the most recent innovation and officials anticipate the trend will grow as word gets around. And the word is bound to get around if Gayle Hulme's enthusiasm is any indication.

"It's not much of a garden plot, only 20 by 10," says Gayle. "But I got a lot of fun out of it last year and am looking forward to the fresh air, exercise and the people I'll meet again this year."

Scarborough, where Gayle lives, has operated the allotment garden program for two years now, says parks director Dennis Manning. Last year 200 plots were cultivated on the Gatineau transmission line near Daventry road. This year another 200 plots have been added.

Gayle, a receptionist who lives in a modest basement apartment in a house on Painted Post drive, got interested in the plots last year along with her landlady, Mrs. Dee McLean.

Mrs. McLean explained, "I have a very small yard and the garden plots seemed to be a good idea. They're not very big but if you plant the right seeds you can get a good crop." She notes that her basement freezer still has an ample supply of frozen carrots from her 1974 crop.

"And I had lots of other vegetables to see me through the winter."

Parks director Manning is excited about the program and hopes to open up at least one new area each summer.

"Of the 200 allotment gardeners we had last year, 75 are back with us this year. Many of those who did not return have moved away," he says.

Residents who live in apartments, townhouses or other rented accommodation are given first priority in the Scarborough scheme. But private homeowners are not ruled out if there is room.

Many of the Scarborough gardeners are pensioners who are enjoying the puttering — among them Mrs. Patricia Falkner, 74, of Alrita crescent.

"I really enjoy it," she says. "But best of all it gives my son, an advertising salesman, some relaxation. We made lots of mistakes last year but learned while doing. I enjoyed talking to the others about their gardens."

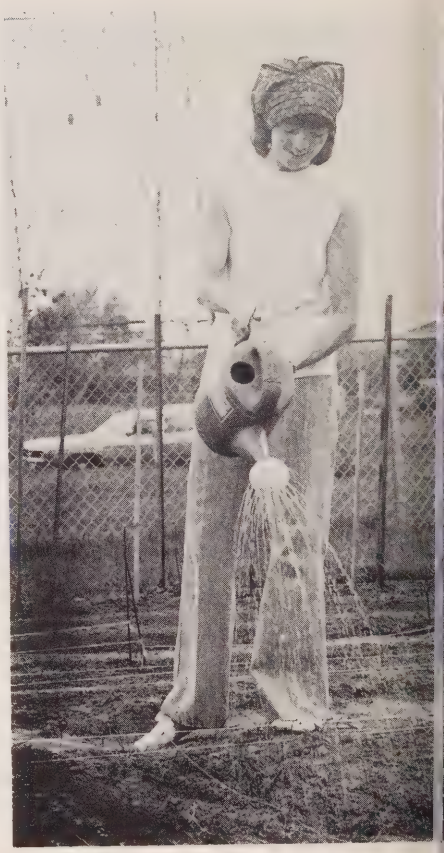
In the fall she spent some time doing down preserves, something she hadn't done for years.

One gardener who won't be back this year is Sally Messenger, who moved to Nova Scotia. However, she took time to write a letter in which she said: "After looking back at all the fun and enjoyment we had — as well as the satisfaction of enjoying produce we had planted and tended — I must pass on to you our appreciation for the program and to add that we hope your expansion program will prove to be a tremendous success."

She added: "My family and I grew a tremendous selection of produce — more than we at first thought possible. We were most impressed with the watering facilities and enjoyed talking shop with all our neighbors."

The Scarborough plots are fenced and each tenant is given a key. A special watering trough was built and each gardener

Gayle Hume waters her garden plot at the Daventry site in Scarborough, while Alan Plac 10, walks to his father's plot nearby with Dennis Manning, Scarborough's parks direct who has promoted the program in the borou





Hundreds of Metropolitan Toronto residents are enjoying having their own gardens thanks to a plan whereby portions of Hydro rights-of-way are made available for plots. The practice is spreading across the province.







waters his plot by hand.

"We decided on this method instead of a sprinkler system because it was less vulnerable to vandalism," says Mr. Manning.

In Etobicoke a sprinkler system has been installed. Etobicoke has plots at three locations with about 500 individual gardens.

All in all, there about 1,200 plots on rights-of-way in Metro Toronto: besides those in Scarborough and Etobicoke, the borough of York has 64 plots at one location, North York has 150 and East York 84; the city of Toronto has 300 on parkland and plans to open some on Hydro land next year.

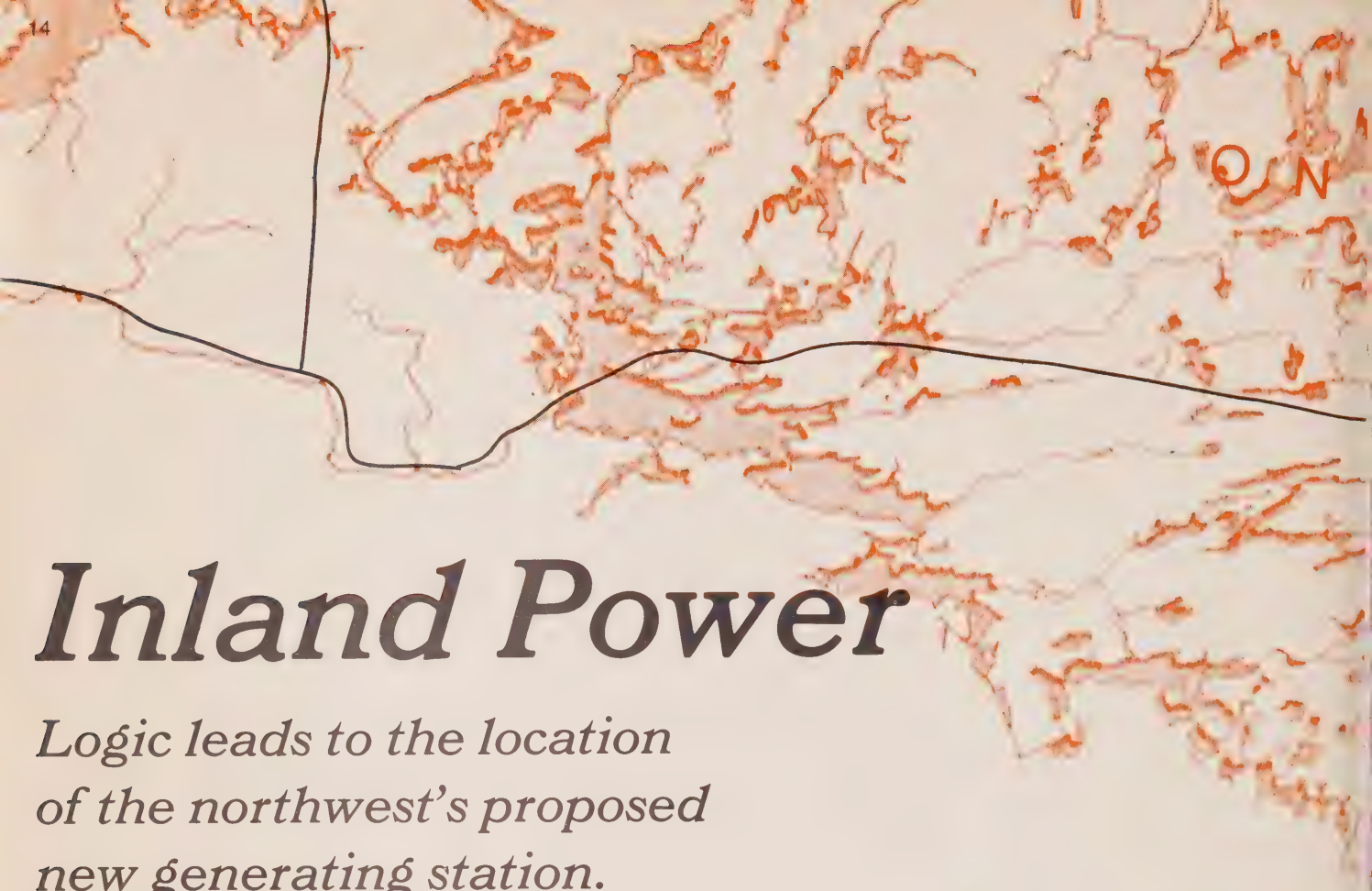
The East York plots are administered by the East York Garden Club, which has been given a free hand to run the project. Last year its members grew 17 varieties of vegetables. But in the early part of the season the plots were raided by groundhogs. To rectify the problem a border of petunias, snapdragons and other flowers was planted around the plots and the smell of the flowers helped discourage the woodchucks from further attacks.

York and Etobicoke are using exterminators in an effort to control the groundhogs.

Communal garden plots are by no means unique to Hydro or Ontario. They have been common in Great Britain and Europe for years, although in most cases parks and railway rights-of-way were used.

The idea came to Canada several years ago and was tried with some success by the National Capital Commission in Ottawa on land leased from Hydro.

Once the seed was planted in Canada, it didn't take long for the idea to germinate and grow into a popular program. □



Inland Power

Logic leads to the location of the northwest's proposed new generating station.

by Lois Wallace

Perseverance and public participation pay off. The people of the Northwestern Ontario community of Atikokan can vouch for that.

For through their efforts, the first two hurdles to getting a much sought-after Hydro generating station on nearby Marmion Lake have been crossed.

First, after many months of intensive study and public meetings, Ontario Hydro recommended to the provincial government that a coal-fired generating station should be built at Marmion Lake, about 120 miles west of Thunder Bay, just over half way between the Lakehead and Fort Frances. This news, in late February, was greeted with jubilation by Atikokan residents, and a page one bannerline and editorial in the weekly Atikokan Progress.

Then in mid-May, Energy Minister Dennis Timbrell announced that the government had approved acquisition of land for the proposed 800-megawatt station.

The next step, before government approval for actually building the station can be given, is a full-scale environmental study which will also involve public participation.

In announcing approval for land acquisition, Mr. Timbrell told a dinner meeting at Atikokan, "There is a very good foundation for excellent community relations in Atikokan and we are all anxious for it to continue."

Excellent is also the word for the endeavors of the community's elected council, representatives of the nearby Steep Rock and Caland mining interests, the Chamber of Commerce, the Board of Education, and many other local organizations and individuals in promoting the Marmion Lake site for a generating station.

For at first, Marmion Lake wasn't in the running for such a project. But various factors began to develop . . .

When Hydro began looking for an energy centre site in the northwest, in October, 1973, the search was focused along the Lake Superior shore between Nipigon, 70 miles northeast of Thunder Bay, and the United States border, less than 40 miles southwest of the Lakehe

With 45 per cent of the northwest's trical load concentrated in the Thunde Bay area, 42 per cent of it located west Thunder Bay and only 13 per cent to th east, the Thunder Bay area itself was t most logical spot for an energy centre

As well, the Ontario government's report, "Design for Development in No western Ontario," has identified Thun Bay as the primary growth centre.

At that time, Hydro was looking for a which could accommodate an 800 to 1,000-megawatt fossil-fuelled station, would be suitable for future expansion include an additional 2,000-megawatt tion, likely nuclear-powered.

For this reason, inland locations on smaller lakes were not being consider

Early public meetings on the site se tion question were characterized by c cern for preservation of the natural se in and around Sibley Provincial Park, peninsula east of Thunder Bay, and th



stretch between the Lakehead and the border.

As a result, Hydro's attention began to focus more sharply on the Nipigon and Thunder Bay areas. Further public meetings in those centres evoked reactions as strongly in favor of Nipigon as they were opposed to Thunder Bay.

During this stage of the selection process, briefs were received from the townships of Nipigon, Dorion, Marathon, Atikokan and the town of Geraldton, requesting that consideration be given to sites in or near these communities.

The Atikokan brief was backed by scores of letters from community service organizations and local individuals pointing out that nearby Marmion Lake provided a logical site. They emphasized that the Hydro project would help offset a projected decline of employment at the Atikokan mining operations.

In response to public opposition to Thunder Bay sites, and pressure to include inland sites, Hydro began preliminary investigation of two additional sites on Marmion and Dog Lakes, the only two inland lakes considered suitable.

It was October, 1974, and time for another round of public meetings. In Atikokan, the meeting turned out to be public with a capital P.

At the urging of council and the Chamber of Commerce, 600 of the community's 6,000 residents turned out to voice overwhelming support for their site.

Both the Chamber of Commerce and council placed quarter page ads in the Atikokan Progress in support of the Hydro project, with each of the councillors reaching into his own pocket to pay for the council ad. An article on the upcoming meeting was given top billing on the paper's front page.

The Marmion Lake site did, indeed, look suitable for a relatively small fossil-fuelled station. It would not, however, be adequate for a two-plant energy centre.

But when the physical limitations, economic, environmental and social considerations for each of the prospective sites were totalled, Marmion Lake emerged as the most suitable location overall for a coal-fired station.

At the same time, Red Rock, just south of Nipigon, surfaced as the most sensible site for the original concept of an energy centre comprising a nuclear station and capacity for adding a coal-fired station.

The advantages of the Atikokan site are many. It is close to a major interconnection point with the bulk transmission system.

And the location of the plant in relation to Thunder Bay would mean substantial savings on coal deliveries from western Canada (see Rekindling Coal, page 8).

Marmion Lake itself has much to offer from an environmental standpoint — and a fascinating history.

The lake is no stranger to power generation. It was created in 1927 as the headpond for Moose Lake generating station, a 13,700 horse-power plant built for the Minnesota and Ontario Paper Company. When that station went into operation, the levels

of several small lakes were raised, joining them into one body — Marmion Lake.

But the influence of the Moose Lake station on the Marmion system was soon overridden as the Second World War's insatiable appetite for iron spurred the search for ore.

The question of how to get at the rich iron ore deposits beneath Steep Rock Lake to the northwest of Atikokan had plagued miners for decades. Attempts at underground mining in the early '40s failed miserably despite the ingenuity of shaft crews. Finally, the decision was made to dewater the lake.

That meant diverting the Seine River system through nearby Finlayson Lake and back into the Seine River further to the west, bypassing Marmion and Steep Rock Lakes. It also meant retiring Moose Lake generating station, which had used Steep Rock Lake as its tailpond.

A massive dredging operation still faced the mining interests. Beginning in 1944, the Steep Rock Mining Company dredged more than 110 million cubic yards of silt, gravel and rock from the middle arm of Steep Rock and pumped it into the west arm.

Development of the east arm of the lake between 1953 and 1960 posed no less a problem for the Caland Ore Company. There, the ore body was overlain by 300 feet of silt and 100 feet of water. Huge suction dredges vacuumed up 162 million cubic yards of lake bottom material and pumped it four miles to Marmion Lake.

Ironically, Marmion's turbulent history bodes well for Hydro.

Because the area has already been subjected to a considerable amount of industrialization, with its environmental effects, it has much less to lose than a tract of virgin forest and lake country.

The Atikokan plant would also make use of the Caland Highway and an existing rail spur, minimizing further environmental disruption and reducing costs.

At first, the vast amounts of silt in Marmion Lake worried the project team. But tests carried out last summer indicated the silt had compacted over the years and would not pose a problem at the plant's cooling water intake provided the water level was kept high enough.

Thanks to the isolation of Marmion Lake from nearby water systems, water level control is simplified. As well, any impact the plant might have on the aquatic environment would be closely confined. The 12-mile circulation path visualized by planners for the cooling water outflow would reduce even further the minimal impact anticipated.

A few voices have raised questions about the proposed station — most of them charging that sulphur dioxide emissions would pose an airborne threat to Quetico Provincial Park, 12 miles south.

But Hydro feels the combination of modern emission control devices and low sulphur western coals to be burned at the plant will rule out the possibility of any such ill winds.

The plant also has important social implications for Atikokan.

The iron mining companies, largely responsible for the making of the town in the post-war period, are now faced with the prospect of having to phase out their operations there over the next three or four years.

The sheer depth of the ore, which frustrated early mining attempts, is once again the culprit. The open pit operation has gone about as far as it can go, leaving tunnelling as the only alternative. It's not, according to the mining companies, an economically feasible one at present.

With the spectre of mine shutdowns on the horizon, Atikokan's community leaders have not been idle. They have been successful in attracting a new wood products plant to the area, and work is nearing completion on both a new hospital and a new Legion hall.

Construction of a municipal airport is to begin this year and the push continues for a highway link to Ignace, more than 40 miles north.

Hard-working Atikokan is also experiencing a housing shortage, but Hydro hopes to avoid compounding this problem by billeting a large percentage of the construction force to be brought in from outside in a camp on site.

Construction of the plant would be spread over a six-year period with the ini tial work force of 150 building to a peak approximately 1,100 in the third or fourth year and tailing off to 90 in the year of co pletion.

Hydro's project team took pains early the public participation process to cauti residents that the plant would not provic an instant solution to the community's impending employment problems.

But further study of the question by operations staff reveals a more optimist picture.

While the size of the construction for needed would mean bringing in the bull workers from outside Atikokan, there would be ample opportunity for local lat ers and skilled tradesmen during the co struction phase.

Once the station is in operation it wil provide about 250 permanent jobs. Alm all of the 70 or so operating positions w be filled by experienced Hydro personn at least in the beginning.

People from the community could tra to take over some of these positions. Al local residents with the necessary skills could also fill skilled mechanical and el trical jobs, stores and office positions, a well as fuel handling and maintenance posts.

The availability of residents for these jobs will depend on when plant constru tion gets under way, and how its start c cides with the gearing down of area mi operations.

But most important for the communi Atikokan, government approval of the Hydro site will mean another round of l work and persistence has paid off. Job will be available.

The town — its history characterize a colorful cast of trappers, miners, lum men and railroad workers — can look t ward to a future less rugged than its pa but just as full of promise. □

DESIGN for the future

by Rae Hopkins

Preservation of the environment has become a new ethic that's leading Ontario Hydro in surprising directions.

For example, trees have become so precious to Hydro that the people building the huge Bruce nuclear power complex are trying their best to save all they can.

On future sites, like Wesleyville and Darlington, Hydro's forestry department has initiated reforestation projects, using species native to the area, so that plenty are around for future use.

Hydro's planners are going all out to reduce the utility's impact on the environment.

Around the Bruce site, stretching for about two miles along the Lake Huron shoreline at Doulgas Point and a mile inland, an entire fringe of trees has been left around the area of the second 3,200-MW station, and where this is impossible — for example, along the shoreline — reforestation will take place, says R.R. Booth, senior design architect.

In fact, he adds, while the Douglas Point area has never been considered bush country, the construction camp has taken on all the appearance of a bush camp. Enough vegetation has been displaced to make way for the mobile home village, but vast islands of trees have been left standing.

And they're stockpiling all the roots, fallen trees, woody vegetation and the like to let it slowly decompose to have an ample supply of organic matter for future landscaping purposes.

If Mr. Booth's plans for the Bruce complex evolve according to his wishes, Canada's nuclear power capital will be returned wherever possible to its original natural setting.

Mr. Booth's hopes for the eventual appearance of the Bruce development typifies Hydro's changing philosophy on the design of facilities which provide electric energy for Ontario.



Environmental preservation is a key factor in Hydro planning

The name of the game is to get the ugly out.

And the rules are quite simple — reduce Hydro's impact on the environment.

What is Hydro doing to reduce this impact?

Just about everything has been taken into consideration: the introduction of approved appearance transmission lines, using single steel poles or new tower designs, lowering the profile of both transformer and distributing stations, imaginative landscaping of plants and highly selective cutting of trees along rights-of-way.

Under the new scheme of things much more than just engineering considerations go into building a generating station, a transformer station or a transmission line.

One of the most important considerations nowadays is the potential for multiple use of the lands on which Hydro's facilities are located. This could range anywhere from park development to garden plots, utility corridors, or fish hatcheries.

At the original Pickering nuclear station, for example, what was once a storage compound during the construction stage has been transformed into 28 acres of hilly parkland. Material excavated for the cooling water intakes, outflows and power house was deposited in the storage compound to help shape the park.

Now that the construction forces are back at the Pickering site, to build the "B" station, yet another recreational outlet will emerge at this nuclear-age edifice in a semi-wilderness setting. This time excavated material is again being stockpiled into a large hill that Mr. Booth hopes will be used for skiing.

A few miles east, on the Lake Ontario shoreline near Bowmanville, Mr. Booth says designers are considering lowering the site of the proposed Darlington nuclear station to reduce its visibility from Highway 401.

A two-mile beach, using the warm water effluent from the plant and stretching to Darlington provincial park, is also being considered.

A little farther east, at the site of the oil-fired Wesleyville generating station, near Port Hope, planners found a number of features they wanted to preserve.

For example, a central wet marsh — a haven for waterfowl — will be left untouched and a couple of streams that cut across the property will be rerouted to maintain the drainage system for lands north of the site.

But one of the most significant improvements being considered for the Wesleyville plant is the use of underground caverns for storage of oil instead of above-ground tanks. The terrain at this site is thought to be suitable and engineers are keeping a close watch on recent developments in Europe in the field of underground storage for liquid fuels.

R.G. Wykes, Hydro's transmission and design engineer, believes that to the layman, the most significant change in the changing scene of transmission line design is the move to use double-circuit single poles in the place of conventional lattice-type towers.

At present there are four steel pole type lines either completed or under construction in southern Ontario. One is in London and the others in the Toronto area, between Leaside and Cherrywood transformer stations, between Cooksville and Lorne Park transformer stations, and between Lorne Park and Burlington transformer stations.

Some steel pole structures may be used on the proposed 500-kV network linking the Nanticoke and Bruce stations on the west and Pickering and Lennox generating stations on the east.

Mr. Wykes says the 500-kV structures will be the largest of their type ever built.

R.E. Westwood, transmission and distribution project engineer, says better appearance is the reason for using the poles, which cost three to four times as much as conventional lattice towers.

"There was a general feeling," he says, "that lattice towers were industrial-looking and not in keeping with modern designs."

Mr. Westwood says steel pole structures are best suited to an urban setting. However, he believes that in a rural setting a lattice tower is more appropriate becaus you can see through its tracery. The tow tends to fade into the landscape.

In 1970, a three-year development pr ject was completed on a low-profile dist uting station to replace costly enclosed bungalow-type stations which were use urban settings.

The Uniform 70 distributing station n only permitted Hydro to lower the profile the facilities, but at the same time cut co struction costs because of the amount prefabrication that goes into them.

Says Lawrence McCall, supervising design engineer of sub-stations, "the ba impact of a sub-station is visual but at th time that we were searching for a way t improve their appearance, we felt we co cut costs. Maximum prefabrication did t trick for us."

He explains that to lower the profile Hydro's designers eliminated much of t structural steel element by using part of electrical conductors as equipment sup ports.

Now the highest point of a distributin station is 15 feet, eight feet lower than conventional model.

Combined with proper landscaping, streamlined station looks as good as ar enclosed model and costs less than a c ventional high-rise open facility.

The low look has carried over from d tribution voltage stations to high-voltag transmission facilities and will be used the extra-high-voltage stations on the p posed 500-kV network.

Another major innovation will be the of compact switchgear insulated with s hur hexafluoride (SF_6) gas rather than t conventional air-insulated equipment n mally used.

SF_6 will be used initially on the three Parkway stations, and, housed in attrac buildings, this switchgear will reduce th amount of land needed for such station approximately 60 acres — one-quarter of the amount needed for traditional op air facilities.

To enhance their appearance even

more, stations will get away from the traditional dark green transformers and the cocoa-colored insulators. Pastels of pale yellow will be used in their place and colored screens will hide the switches and bus-work.

No longer will straight roads lead into transformer stations. Driveways are curved and the ground around them contoured so that you won't notice the electrical circuitry at first glance.

Hydro's concern with the environment isn't new.

Back in 1970, then general manager, Dr. J.M. Hambley, called together a group of senior management personnel to organize an in-house committee called the Environmental Co-ordination Committee — Amenities.

Headed by P.G. Campbell, general manager — design and construction, the committee's membership was drawn from the generation projects, property, public relations, research, stations projects, system maintenance, system planning and transmission and distribution projects divisions.

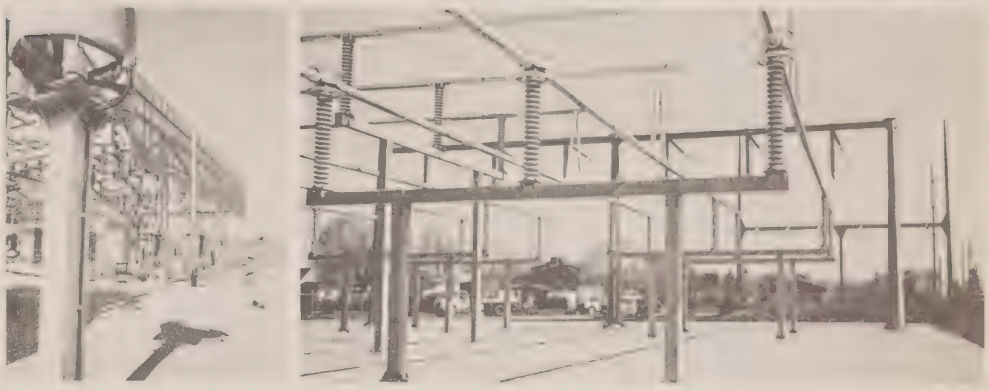
That committee is the third Hydro task force dealing with environmental matters. The other two groups look into ways of protecting air and water quality.

The amentities group is responsible for making recommendations in such areas as the appearance of old and new Hydro facilities, noise factors at facilities, external uses of facilities including rights-of-way and properties, and keeping government and the general public informed regarding future plans.

Arthur Hill, recently-appointed director of Hydro's new route and site selection division, perhaps best expresses the changing philosophy of design when he says, "it's a different type of thinking now than what it used to be. We now have to think of new plants and the lands on which they're situated in a different way than just the engineering features.

"It doesn't always cost great sums of money to add the amenities the public wants — in fact, it sometimes costs very little." □





Tall pines separate the new low profile Lorne Park transformer station from neighboring homes (top) and colored screening (lower left) disguises the electrical apparatus. Electrical conductors are used as equipment supports to reduce the height by one-third.







At the conventional model Cooksville transformer station, bulk power is moved into the station via lattice-type tower lines (top) to the tangle of overhead steel (lower photos) But with Hydro's new landscape policy, it's expected that you won't be able to see the forest of steel for the trees

CNA/ANS conference

Communicate with public, nuclear scientists advised

Canada's nuclear program won high praise from a leading U.S. authority on energy at a recent joint technical conference of the American Nuclear Society and the Canadian Nuclear Association which attracted more than 300 delegates from around the world.

Dr. George Cunningham, assistant director of technical development of reactor research for the U.S. government's Energy Research and Development Administration (ERDA), told a session of the April 28-30 conference in Toronto:

"The outstanding performance of the Pickering power station has received well-deserved kudos from around the world. Its success represents the commitment and expertise of the entire Canadian nuclear community."

He urged Canadian and U.S. nuclear scientists to become involved in public enlightenment, saying, "We, as responsible engineers and scientists must provide adequate information so that decisions regarding the future of nuclear power can be made on the basis of public understanding and consensus.

"I think our own experiences in the last few months have indicated that the media does not in general have the technical expertise to evaluate the validity of statements made by either side in public debate. Thus the issue of nuclear power is rarely portrayed in terms of the real choices."

Dr. Cunningham said the U.S. has two reliable energy sources with an assured technology base — coal and uranium — but because of public concern there is difficulty in proceeding with the utilization of both these resources. Part of the problem, he said, stems from lack of information.

Commenting on reports on the dangers of plutonium, the U.S. expert said it must be put in the framework of the many toxic and carcinogenic chemicals which exist in enormous quantities. "Personally, I prefer plutonium to asbestos," he said.

Dr. Cunningham stressed that plutonium is, indeed, a highly radiotoxic substance, quite comparable to radium and other radioactive substances that occur in nature. However, its reputation as a toxic substance has been irresponsibly exaggerated in the public mind by oft-repeated statements by nuclear critics.

"It's about time we in the nuclear community stop being so defensive, and fearful," he said. "We seem to be battered by our critics into a helpless state — wincing at each critical comment. While it is true that there are areas within nuclear technology that need development or confirmation, and there are legitimate public concerns related to these areas, the fact is we have produced a technology with an outstanding safety record and strong economic base. Nuclear energy is a technology which will help both our nations to maintain their stable economic base. Moreover the breeder reactor will assure an electrical energy option that promises stable electrical costs and abundant energy resources well into the foreseeable future."

In a paper entitled "Fuel for a Thousand Years", Dr. A. J. Mooradian, vice-president of Chalk River Nuclear Laboratories, quoted statistics indicating that the total world commitment to fission power stands at 340,000 MWe, covering plants in operation, ordered, and under construction. Dr. Mooradian said this capacity is equivalent to the energy available from 3 billion barrels of oil per year — roughly three quarters of current U.S. oil requirements.

"Assuming a 70 per cent availability of nuclear plants, and that oil can generate electricity 30 per cent more efficiently than nuclear fuel, the conservative estimate for nuclear installations in the year 2000 is equivalent to 26 billion barrels of oil per year," Dr. Mooradian stated.

Present world oil consumption is 18 billion barrels per year.

"In other words, the technology and the industry are sufficiently advanced that nuclear installations are predicted to produce one and a half times as much electricity per year as could be produced from today's world oil capacity.

"It is inconceivable that any technology, however promising or imminent, could do as much to relieve the world's energy supply problem," he said.

He singled out the U.S. light water reactor and its adoption elsewhere in the worl but added that Canada's heavy water rea tor has a major contribution to make.

"The excellent performance of Picker ing is important not because it is a Cana dian achievement, but for the world at large. It has proven the viability of a heav water moderated pressure tube concept.

Various conference papers dealt with present operating experience with nucle fuels, fuel defect mechanisms, reprocess ing technology, recycled fuel fabrication and shipment of spent fuel.

George Fanjoy, manager of Ontario Hydro's Central Nuclear Services, dis cussed Canadian nuclear fuel operating experience, outlining changes that have taken place in the interval between devel opment of the first demonstration station NPD 17 years ago to the experience with Pickering and Douglas Point.

R. W. Barnes, an Ontario Hydro nucle design engineer, reported that Canada's objectives in waste management are to minimize potential hazards of waste and place as minimum a burden as possible future generations.

He said plutonium contained within Canadian spent fuel bundles is a potenti resource and until some decision is mad as to what to do with it the spent fuel is safely shielded under water in station st age bays (see Pool Shields Nuclear Fuel Hydro News, November/December 197

He added that as it is Hydro's respons bility to provide suitable interim storage facilities, a special task group was estab lished within Hydro in 1974, to study spe fuel management. The task group's sch ule calls for the construction of an interi central fuel storage facility to be in servi by the end of 1985.

As soon as a storage concept is agre upon, public participation will be sought locate a site, said Mr. Barnes.

"This will involve public meetings, pr entation to local officials and will likely f low the steps now set out in Hydro's pul participation planning procedures."

The present timetable calls for site approval in December 1981, constructi licence in July 1982 and an operating licence in December 1985. □

AMEU summer conference

Fuel costs cited as major factor in rate hike bid

Ontario Hydro's proposed 29.7 per cent ate increase was brought about by many hings, but looming large among them is he cost of fuels, says G.R. Currie, general manager — regions and marketing.

Speaking to a province-wide gathering f municipal utility managers and senior taff at the Association of Municipal Elec- rical Utilities annual summer conference or management at Niagara Falls, Mr. Cur- e said that last year Hydro estimated how uch the various fuels would cost this ear. In each case the fuel cost went much igher than Hydro had anticipated.

He pointed out that in 1973 Hydro was aying an average of $13 a ton for coal. In 974 the cost rose to $20 a ton, and this ear, to date, the cost is $31 a ton and nother 21 per cent increase is estimated or 1976.

"This works out to roughly a tripling of ost in three years, or a 200 per cent ncrease. It's a world pricing situation, and e've been sharing with the public our oncerns about it, but it just doesn't get uch publicity.

"And why should it? Nobody buys coal y more. Well, unfortunately, Ontario ydro has to, and it's not just to keep our uildings warm — it's the raw material we nvert to electrical energy. Last year we ocessed 7 million tons of coal into kilo- att-hours," Mr. Currie said.

He added that fossil fuel plants now rep- sent 45 per cent of Hydro's generating apacity and account for one-quarter of its venue.

"The fact is that coal has gone up in ice quite a bit more than oil, even rough the much-publicized oil crisis. For ost customers, the oil price increases ow up at the service station — the larger al price increases show up in the elec- c bill.

"But, if it's any consolation to you, bulk ices for gas have increased more than coal, and our projection to 1980 indicates that both oil and gas will escalate in price faster than coal."

Mr. Currie suggested that under ordinary circumstances, most utilities would be just as happy without a rate review process (such as Hydro is now undergoing before the Ontario Energy Board).

"But, in the present situation I can say with all sincerity that those involved at Ontario Hydro consider it quite essential that our rate proposals be given this exposure to public challenge.

"When we're faced with increases of this magnitude we need the rate review process just as much as any intervenor does, if we're to convey to the public the realities of the electrical energy situation and have them understand the options."

Mr. Currie said that in Hydro's 1974 forecast it was expected there would be a reduced growth for 1975 and that it would pick up again in 1976.

"As a result of the economic clouds, the forecast was adjusted downward for December of 1975 and 1976. We could very well be in a period of change in trend, and this makes life difficult for any forecaster.

"However, in collecting information from the municipal utilities, from our areas, and from direct customers, we have had no indication that customers plan to cancel or postpone their investments in new plants and equipment.

"I think it's quite safe to say that energy growth between now and 1982 is going to be pretty substantial. Ontario is a popular province and every year the population grows by many thousands.

"Moreover, there is a good chance that many industries now using oil and natural gas may, because of the increase in price of fossil fuels and the uncertainty of supply, change over to a greater use of electric power. A few gas customers have already been given notice of termination of contract.

"In the face of substantial increases in cost for all forms of energy, there is still concern as to whether the demand can be met.

"Of course," Mr. Currie said, "the financial implications of meeting this growth rate are of great concern. The total sum required by Hydro between 1974 and 1982 has been pushed by inflation from $16.7 billion, estimated last year, to $23.8 billion. The $1.3 billion we'll be borrowing this year will seem modest in 1982 when we'll have to borrow $3.8 billion."

Mr. Currie noted that Hydro will have to rely more heavily on foreign money markets to borrow these amounts. This, he pointed out, adds the question of foreign exchange fluctuations to all other risks.

In addition, Hydro will have to rely more and more on short and medium-term bonds. "The simple fact is that investors are becoming reluctant to lend money on a long-term basis at fixed interest rates.

"In view of these considerations it should be pretty clear that we must ask for a rate increase which includes a component for system expansion, and this component must be large enough to keep our borrowing within manageable limits. There's also a requirement that rates be high enough to assure investors that the business continues to be a good going concern.

"In other words, it has to keep up its credit rating. The brutal fact of life is that institutions with unsatisfactory credit ratings simply cannot attract funds at any interest level."



G. R. Currie

And Mr. Currie refuted suggestions from several quarters that if the people of Ontario could make the effort to bring the 7 per cent growth rate down to 4 per cent, the rate increases and the capital requirements would be considerably less severe.

"It's a logical enough statement, and of course, Hydro would support any appeal to customers to avoid wasteful use of energy, and indeed avoid waste in the use of any goods, on the grounds that they all use energy in their manufacture.

"However, at the same time it would be unfortunate if anyone were led to believe that such a program offers a realistic alternative to the rate increase proposed.

"Conceivably the load growth in a single year could be held to 4 per cent through stringent conservation methods — it can even occur as a result of a mild December.

"But to hold growth down to this level for a period of years would be asking for a considerably lower growth rate than was experienced in the years 1930 to 1935 during the depths of the depression.

"The one thing that would really help us out of the problem would be, by one means or another, to bring this devastating rate of inflation under control. This isn't just rhetoric. There's no industry more vulnerable to it than yours and mine, and we ought to be ready to support any measure that offers hope of curbing inflation.

"The avoidance of waste is one such measure, of course, and to this extent we have something in common with the 4 per cent school," Mr. Currie said.

"At present," Mr. Currie added, "Hydro's total generating capacity is 17 million kilowatts. As it turns out, we're going to need another 11 million kilowatts between now and 1982. To this end we have power stations either under construction or committed for future service.

"But that's not all. In addition we've asked the provincial government for authority to commit ourselves for yet another 6 million kilowatts of new generating capacity — practically all at two nuclear plants — which takes us up to around 1985. The cost of this program runs into many billions of dollars."

Hydro's plans, Mr. Currie pointed out, are based on the assumption that energy demand will increase at or close to its historical rate of about 7 per cent a year right up to the 1980s.

Management 'needs' problems

The problem of developing a conference for management in today's climate isn't in considering what to include in the program, but what to leave out, says Association of Municipal Electrical Utilities president Bruce Prentice.

Leading off the AMEU's annual summer conference, Mr. Prentice, who is general manager of Toronto Hydro, suggested that problem areas demanding consideration, discussion and resolution seem to arise on all sides.

"But," he said, "that's what management is all about — solving difficulties quickly and effectively as they occur.

"Perhaps more important, it is management's responsibility to forsee potential problems and to prepare for them in such a way that the adverse effects are negated, or at least minimized, and any possible beneficial effects are maximized.

"But make no mistake about it, this is what management is all about," Mr. Prentice said.

He challenged utility managers and senior staff from all over the province to picture an organization without problems. "It follows that no judgmental decisions are required, therefore the operation can be completely automated with today's technology. No people will be required and no manager is necessary.

"However, in this situation no changes will be made, no improvements in product, in productivity or in service — just a machine continuing to do its thing until it gives up or is scrapped.

"But, as managers we all know that when you make a change you create problems, certainly for yourself and often for others as well.

"Because these changes have been foreseen and provided for, the problems they create are minor compared to the problems caused by external changes which are often beyond your control and often arise at the worst possible time.

"But, again, that is what management is all about," Mr. Prentice said.

Mr. Prentice added that managers tend to think that change is bad when someone else causes it and problems are created which land in management's lap.

"I'm sure if we took a poll of businessmen like ourselves today, anywhere in the western world, we would find the same half-dozen or so problems at the top of everybody's list". . .

— Inflation, and the great difficulties that i creates for future planning for individuals, for organizations, for business and for go ernment.

— Unemployment, which brings hardship to individuals and possible social unrest, and brings with it a decrease in productivity and efficiency which no nation can afford.

— Changes in public attitude which possi bly stem from the bewilderment of people half-informed by "instant-on" news media who are consequently confused, skeptica and militant.

— Changes in legislation, decreed by our government leaders in their efforts to con trol change as they see it, frequently caus problems for individuals and business as they attempt to conform with new and unfamiliar rules.

"On the other hand, we tend to think that change is good when we ourselves ii tiate it. We change business routines for greater efficiency. We change the educational and skill levels of employees for greater productivity. We advertise to change the public's behavioral patterns - whether it be to buy or to conserve.

"These kinds of change we consider beneficial and important.

"And we realize that if we do not initia change, then our organization approach the fate of the automated marine warning device that never changes, never improv productivity, just does its job year after year with only occasional inspection and maintenance.

"It's probably true that any change cre-
es problems for somebody, somewhere.
hen change is inevitable, as it seems to
, it is obvious that there is nothing to be
ined by complaining or bemoaning our
e," Mr. Prentice said.

Leadership key
o responsibility

e most difficult problem a person in a
sition of responsibility will have to deal
h is leadership, says Dr. C.G. Baird of
Sir Wilfrid Laurier University school of
siness.

Speaking to delegates at the AMEU
nual summer conference, Dr. Baird sug-
sted that leadership is the ability one has
ead others, while authority is the ability
govern others.

Back in the '60s, Dr. Baird said, leader-
p was considered immoral to the point
t younger people "copped out"
cause they failed to understand why
one would want to be in control of oth-

"However, I believe that leadership is an
norable ambition and an onerous one
. You must go in there with a desire to
d others because you'll be judged by
quality of your deeds and actions.

"There's a vast search for leadership
ng on all the time, nationally, provin-
ly, in industry and right in your own
ne.

"Every manager must earn the right to
a leader, for the people you're groom-
to take over when you step down are in
images of yourself. They imitate their
lers," Dr. Baird said.

He suggested that a great deal of indus-
suffering, such as strikes, are brought
ut by individuals reacting to their lead-

Dr. Baird suggested 26 questions to be
to potential leaders, ranging all the way
n have they broken a bad habit to do
shun the problem person.

"One of the most tangible costs of being
ader is self-sacrifice. You must sacri-
something for leadership and another cross the leader will bear is loneliness.

"Another cost of being a leader is fatigue. The world is run by tired people. Yet another cost is criticism — no one really likes it and would prefer positive feedback. Another is rejection. As a leader you have an ego drive and rejection cuts deep into the ego drive.

"Then there are the costs to others involved in leadership, quite often the greatest cost being to your family," Dr. Baird said.

And he suggested that a leader should not compromise. "Compromise," he said, "is the partial waiving of your principles for agreement and the more dangerous your future will be if you compromise. There are some things I'm so principled about that I'd gladly lose my job over them," he said.

Dr. Baird said a leader has to learn to cope with failure, for the successful leader is one who realizes that no failure is permanent.

"But the greatest peril of leadership is pride. Pride can be defined as self esteem blown out of all proportion. Your subordinates know your blind spots," Dr. Baird concluded.

Delegates reject purchasing plan

A suggestion that municipal utilities consider establishing a central purchasing authority was rejected by a majority of delegates to the AMEU annual summer conference.

Dr. H.W. Prout, of Sir Wilfrid Laurier University's school of business, suggested that the establishment of a central purchasing authority could achieve substantial savings for utilities.

In addition, he said that a central purchasing authority would help utilities handle their suppliers.

But in a discussion period after Dr. Prout's talk, a majority of the delegates disagreed with the central purchasing authority concept.

And one, Miles Duffus, manager of Wallaceburg Hydro, suggested that rather than consider a central purchasing authority, utilities "take a little closer look at co-operation among themselves."

Dr. Prout said, "Municipal utilities are criticized no matter what they do. Developers want electrical service now. Yesterday is too soon and tomorrow is too late. But today is just right."

Dr. Prout suggested that suppliers, not the utilities themselves, are in control of utility inventories.

Dr. Prout said that even in a computerized world there is a need for inventory management.

"Electric utilities," he said, "have lots of inventory building toward an uncertain future. There's no need to maintain an inventory beyond what the utility expects to have a demand for — but that's something no utility knows for sure.

"If the inventory is reduced, the utility takes the risk of not being able to meet unexpected demands for electrical service.

"The major problem" he said, "in maintaining an adquate inventory is to have materials available to meet the demand for service brought about by new construction. A utility is put into the position of having to predict when new construction is going to take place in its municipality and therefore must have some sort of inventory on hand to meet the increased demand that will result.

"And an adequate inventory is a perpetual debt on the consumer. It's a debt that never will be amortized. If the cost of maintaining a large inventory is put to the developer, that cost will be reflected in the price of a home.

"Utilities then, are maintaining an inventory for the benefit of the developers and not for their existing customers. But the problem is in getting the developers to pay for it. Therefore it becomes easier to get the existing consumers to pay the bill in their charges for electrical service," Dr. Prout said.

He disagreed with statements to the effect that most industries have too much inventory and said he's not convinced there's a general inventory crisis — that industry, by maintaining a large inventory, is just reacting to the inflationary spiral. □

EUSA diamond jubilee meeting



Seath censures lack of safety communication

There's an apparent lack of communication between utility management, supervisors and staff when it comes to safety education and procedures, says D.M. Seath, retiring president of the Electrical Utilities Safety Association.

Mr. Seath told EUSA's diamond jubilee gathering at Niagara Falls that this lack of communication was brought to light at a recent round of province-wide management-supervisory safety seminars.

"This (lack of communication) can occur in any organization but it is certainly one that can be improved upon with a sincere effort by all levels of responsibility.

"Good communications, to be effective must involve a free flow of information and suggestions between management, supervisors and tradesmen in both directions. Regular safety committee meetings with levels of responsibility involved are excellent forums for good communication," Mr. Seath said.

The theme of the management-supervisory meetings was "calling a spade a spade," Mr. Seath added, "and this atmosphere should exist in any discussions in order that everyone may feel they are involved.

"Our accident record in 1974 was, unfortunately, one of the worst in many years. Utilities suffered six fatal accidents during the year — four of electrical origin and two from a motor vehicle accident. Compensable injuries rose from 427 in 1973 to 490 in 1974 and accident costs rose from $687,459 in 1973 to $929,165 last year, an increase of $241,706," Mr. Seath said.

He pointed out that EUSA isn't a regulatory body, that it can only recommend, advise and follow up with its membership in the matter of safety. But to realize the value of EUSA, each member should be completely conversant with the facilities EUSA has to offer, determine those fac

s which would be of value to their partic-
ar operation — and use them.
"I've found," Mr. Seath said, "that to
me degree the potential value of EUSA is
t fully recognized by its members. It
ems we're quietly efficient — possibly
e should be more voluble at the risk of
owing our own horn, but in the over-all
erests of safety.
"In our contemporary society the
nphasis seems to be on various well-
eaning groups dedicated to the protec-
n and preservation of our natural
sources.
"Everyone involved in safety has a high
gree of dedication to the protection and
eservation of human resources."

Cracking down on lawbreakers

legates to the Electrical Utilities Safety
sociation's diamond jubilee meeting
re urged to "pay attention to EUSA's
ff — they're doing a damn good job."
R.K. Cleverdon, director of the Ontario
nistry of Labor's Construction Safety
anch, in an off-the-cuff, freewheeling
k dealing with how the Construction
fety Act applies to electrical utilities and
e construction industry in general,
pealed for immediate reporting of con-
ctor "dig-ins" to his office.
He said that if contractors failed to first
termine the location of a buried cable
office should be advised at once "in
ler that we can get them into court."
Mr. Cleverdon pointed out that heavy
es will be urged against contractors fail-
to contact a utility to determine the
ation of buried cable that could result in
ury or death to workmen.
And he cited instances where workmen
been fined up to $50 for failing to wear
ard hat on construction sites, and sus-
nded for failing to wear safety boots.
There was one case, he said, where a
k driver was suspended for not wear-
safety boots while driving his vehicle
o a construction site.

Stiffer fines and suspensions, he added, have cut foot injuries by 25 per cent.

Mr. Cleverdon said the conviction rate for underground cable offences is about 95 per cent because the department's attorneys won't prosecute unless they're sure they have an iron-clad case.

But, he said, there's little case law for the courts to refer to in assessing penalties for offenses under the Construction Safety Act.

Department of Labor inspectors don't make the laws, he said, they just enforce them.

"The law," he added, "isn't intended to belt you over the head. It's just a set of guidelines to keep you alive."

Last year, Mr. Cleverdon pointed out, the Workmen's Compensation Board paid out a total of $50 million in claims — $25 million of which was for a combination.of 800 deaths and injuries resulting in permanent disability to workers.

Mr. Cleverdon praised the safety efforts of utilities, suggesting that they, through EUSA, spend more time and money in safety education and programs than any other employers.

Attitude cited in carelessness

It's not machinery that kills men — it's the breakdown in man's attitude — says Dr. Tom Haggai, of High Point, North Carolina.

Dr. Haggai, known throughout the U.S. for his lectures and syndicated radio broadcasts, "Values for Better Living," told delegates to the Electrical Utilities Safety Association's diamond jubilee celebration in Niagara Falls that accidents are caused by a breakdown in man's attitude — a feeling that no one cares — that tends to make him careless.

The former Baptist minister, in an address he called, "Let's Rebuild the Front Porch," suggested that before the Second World War just about every home had a front porch.

"Porches were all the same. They had a rocker in one corner and a swing in the other. It was a place for neighbors to get together and talk.

"In the period of prosperity after the war, porches were screened in. Then they were glassed in. Then venetian blinds were added so the porch soon became just another room in the house.

"Then porches were soon forgotten. And as a result people hardly know each other anymore.

"People always talk about getting together, but do nothing about it.

"This applies to the safety man. You can talk about all his training, his skills, modern equipment and the like. But he still can't make a dent in the accident frequency."

He added that last year in the U.S. there were 400,000 accidents with power lawnmowers alone. Last year more people were killed in automobile accidents than in any given year in any given war the U.S. has ever been involved in.

"It's the good life, the affluent society that we enjoy today that's behind it. We began to think we could buy our way out of just about every problem. We offered to make a contribution (financial) rather than do anything for an organization that's there to help mankind.

"In our so-called affluent society, people can make as much money by not working as they can by working.

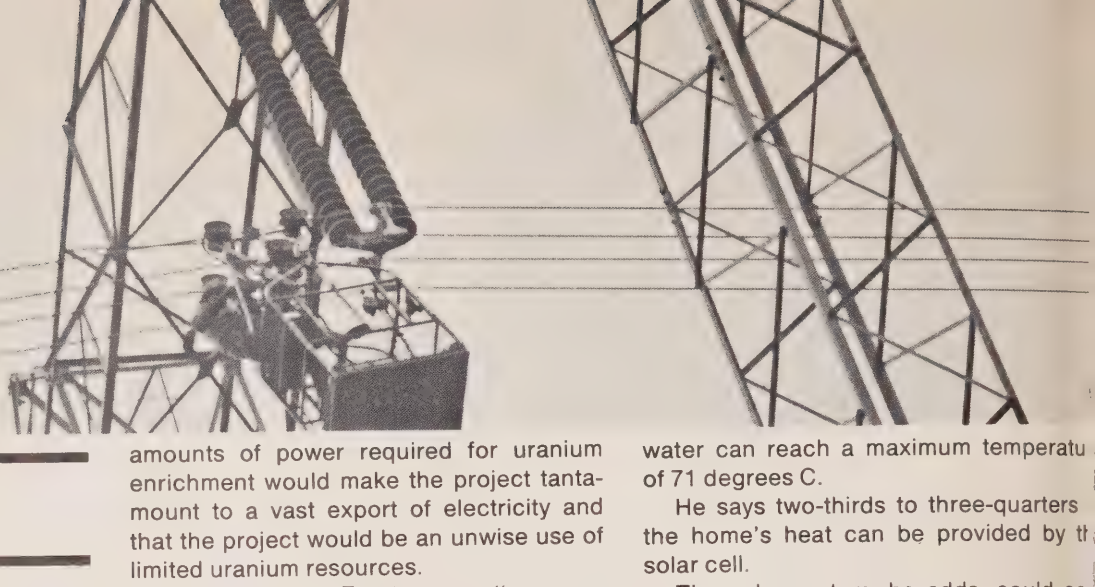
"We, in thinking we can buy our way out of our problems, haven't learned that it takes more wisdom to learn to give with discretion than to receive with appreciation.

"But the man who cares anything about his fellow man must care about every aspect of him. If we continue to make it advisable for people not to work, we hurt people."

Safety people, Dr. Haggai said, care enough about people to give them the right to work.

"If people don't use what they have, they lose it. By giving people the right to work you are giving them something. The hardest thing in the world is to get people to like themselves." □

along hydro lines



Uranium sales allowed

The federal government has approved six uranium export contracts involving a total of about 20,340 tons of uranium oxide for shipment to Italy, the U.K., Spain, West Germany and Finland in the 1990s.

The exports are subject to Canada's obtaining special bilateral nuclear safeguard agreements with the importing countries to prevent the uranium from being used in the manufacture of nuclear explosives.

The agreements will involve "upgrading to the fullest extent possible in Canada" of the Canadian uranium, says the Atomic Energy Control Board.

Exports approved so far under Canada's eight-month-old uranium export policy are:

— 10,000 tons to British Nuclear Fuels Ltd. in the U.K. by Rio Algom Mines Ltd.

— 3,000 tons to Spain, 2,140 tons to West Germany and 1,400 tons to Italy by Eldorado Nuclear Ltd.

— 2,000 tons to Spain by Denison Mines Ltd.

— 1,800 tons to Italy by Consolidated Canadian Faraday Ltd.

Other proposed uranium export contracts are still being reviewed by the Canadian government and further approvals are expected to be announced during the next few months.

In the meantime, a "prefeasibility study" on whether to build a uranium enrichment plant in the James Bay territory in northern Quebec has found that uranium should prove to be abundant in Canada, an official of a Quebec government corporation says.

Fred Ernst, vice-president of James Bay Development Corp., says the corporation is studying the possibility of a uranium enrichment plant in conjunction with the French Atomic Energy Commission and two companies in the Canadian Pacific group.

The prospect has aroused acute concern in some quarters in Ottawa and elsewhere on the grounds that the huge amounts of power required for uranium enrichment would make the project tantamount to a vast export of electricity and that the project would be an unwise use of limited uranium resources.

However, Mr. Ernst says, "we now export uranium, raw or semi-processed, to several countries, but it is surely in the national policy to have our raw materials manufactured here to the greatest extent possible, rather than abroad.

"It's better to export uranium hexaflouride, which is in fact produced at Port Hope, rather than raw uranium. Then why shouldn't we go one step further and enrich uranium hexafluoride here instead of shipping it for that purpose as we now do to the U.S. and U.S.S.R.?

"By 1982 there will be no more oil exports to the U.S., bringing a foreign trade loss of between $4 and $5 billion a year. Exports of uranium enrichment service to the tune of $1 billion a year would arrive just in time to offset part of the resulting deficit to our balance of payments," Mr. Ernst says.

Sunshine home

A Toronto architectural firm plans to build an experimental three-bedroom house in nearby Mississauga using solar energy as an auxiliary heating source.

The project, by Lee, Elken and Becksted, will be constructed in Credit Mews in the new Meadowvale development.

Roger Paulson, spokesman for the firm, says the initial cost of the home will be high — $12,000 just for the solar collector.

However, he hopes the experiment will lead to greater production of such homes.

The solar collector is a pane of glass and a special copper plate in which a fluid is circulated to trap the sun's rays. The heat is then conducted to a 5,000-gallon tank of water.

A heat exchanger converts the heat for use in the home. Mr. Paulsen says the water can reach a maximum temperatu of 71 degrees C.

He says two-thirds to three-quarters the home's heat can be provided by th solar cell.

The solar system, he adds, could co tinue to provide heat for about a week overcast weather and could save $100 $250 a year on heating bills.

Mississauga council's general comm tee has approved the site plan for th house, permitting construction to g under way without the normal eight-we processing period.

Stand reversed

Kitchener aldermen have reversed th stand on the restructuring of electrical ut ties in Waterloo Region and now favo separate Hydro system for the city.

Earlier, the city fathers favored one u ity to serve the entire region.

The system council now favors wo provide electrical service to all areas of t city, including annexed areas of Bridgep and the former Waterloo township, wh are now served by Ontario Hydro's ru system.

At a recent council committee meeti the aldermen heard city co-ordinator Darrah's concern that a region-wide Hy system would force higher rates on residents.

The committee has agreed to ask regional council to review its decision press for a single commission to repl the 13 utilities in the region.

Unless the region changes its stand, views it presents to a provincial steer committee on the restructuring of mur pal utilities would be opposite to those Cambridge and Kitchener.

The PUCs of the former municipali of Galt, Hespeler and Preston have alre asked the province to approve their ar gamation into one Cambridge commissi

Mr. Darrah says the main reason f one-tier regional utility would be to lo rural rates by applying a uniform

cross the region. The uniform rate, he pinted out, would be higher than Kitchner residents are now paying since it ould have to meet the higher costs of ervicing rural areas.

Mayor Edith MacIntosh told the committee that she is no longer convinced a one-er system is best. She has called for a view of a year-old task force report on structuring of utilities in the region that ys four systems would provide the best ancial advantage to customers.

Kitchener, Waterloo and Cambridge ould have their own systems, and a fourth ould be set up to serve the rural-wnships.

However, in voting for a single Hydro lity for Kitchener, the council committee d not decide whether it should be super-ed by an autonomous commission or by committee of council.

lant purchase

omic Energy of Canada Limited will purase the heavy water production plant at rt Hawkesbury N.S., from Canadian Genal Electric Co. Ltd., of Toronto, for $93 llion.

The federal government has approved purchase, which gives the agency nership of the only privately-run comrcial heavy water plant in the nation.

AECL will make a downpayment of $30 llion this year and the remaining $63 mil-n will be paid in annual instalments over next decade. The federal treasury will ke the payments from the operating rev-ue of the plant, which produces 400 tons D_2O yearly.

Heavy water is used as a coolant and derator in Candu-type reactors.

Act to enlarge board

Energy Minister Dennis Timbrell has introduced an act to amend the Power Corporation Act into the Legislature. Among the proposed amendments is one to expand Hydro's board of directors from the present 13 members to 15.

If the amendment is passed, there will be three vacancies on the board. The seat occupied by former chairman George Gathercole has remained vacant since his retirement last December.

Wiring standards

An Ontario Hydro committee looking into the use of aluminum wiring for residential wiring systems has proposed stricter regulations for the use of it.

A study conducted by the task force has disclosed that a receptacle or plug is more likely to overheat with aluminum wiring than with copper under equal conditions.

However, says J.A. Dicker, Hydro's manager of electrical inspection, the number of reported failures is small compared to the number of installations.

Mr. Dicker adds that his department is in constant touch with the Ontario Fire Marshal's department, which has not recorded a single fire that could be directly attributed to aluminum wiring.

The committee identified specific areas of concern and presented these recommendations to the Canadian Standards Association:

— Present CSA standards on wiring components, where aluminum conductors can be used, be re-assessed and updated to ensure their continuing suitability.

— Steps be taken to define a minimum acceptable standard of workmanship.

— Performance of wiring components be closely monitored.

Hydro has asked the CSA to take immediate action on its recommendations.

Steps have already been taken following complaints last year about a particular type of receptacle. These included a change in design to eliminate unsuitable connections on receptacles, the reaffirming of the CSA requirement for non-ferrous binding head screws, and replacement of zinc as a coating material. It was found that zinc has a detrimental effect on aluminum.

The CSA committee responsible for the wiring code also adopted a ruling covering aluminum conductors, with a requirement that equipment connected to these conductors be specifically approved for the purpose and marked to this effect.

The committee, which included representatives of the CSA, Hydro and manufacturers of wire and cable and electrical equipment, was set up by Hydro last year in the wake of concern in the U.S. that aluminum wiring constituted an undue fire hazard.

Emphasis on nuclear

It's virtually certain that future expansion of Ontario Hydro's system will be heavily nuclear, says chairman Robert B. Taylor.

Mr. Taylor makes the prediction in the foreword of Hydro's recently released 1974 annual report.

Mr. Taylor says it became evident in 1974 that fuel availability will pose a problem in the future.

"Inasmuch as uranium is indigenous to Ontario and the Candu reactor has proved eminently successful, it seems virtually certain that future expansion will be based on nuclear power complemented by the addition of some fossil-fuelled generating stations," Mr. Taylor predicts.

Equally important, he adds, last year brought a keener appreciation of the need to learn how to conserve energy.

"The oil crisis abated but left in its wake the vivid realization that the day of 'cheap' energy is over and that there exist definite limits to such non-renewable resources as

coal, oil and natural gas," Mr. Taylor says.

Double-digit inflation appeared on the scene for the first time since 1951.

"The cost of delivered coal, for example, went up 55 per cent — from $12.75 a ton to $19.75 a ton. In the face of this accelerating inflation, Hydro had no alternative but to announce substantial rate increases for 1975," Mr. Taylor says.

And he adds that Hydro has presented rate proposals for 1976 that would mean an average increase of 29.7 per cent in the wholesale cost of electricity.

(The Ontario Energy Board is holding public hearings into Hydro's rate proposal).

Hydro took important steps in 1974 to improve its relations with the public it serves.

Hydro accepts, Mr. Taylor says, "as an integral part of its role, the desirability of involving the public in the major decisions for system expansion that must be made to ensure an adequate supply of electricity in the future."

Western world's first

The Canadian Coast Guard and Atomic Energy of Canada Limited are investigating the use of nuclear power in a planned 80,000-horsepower heavy duty Arctic icebreaker.

The proposed vessel would be the only nuclear icebreaker in the western world and could cost between $130 and $150 million to build by the mid-1980s.

This would be approximately $30 to $50 million more expensive than a conventionally-powered icebreaker of the same capabilities.

However, AECL estimates that over four years nuclear fuel would save about $20 million compared with bunker fuel oil. If oil prices continue to soar, the saving could be even larger.

Over a typical 30-year amortization of such an icebreaker, nuclear power would more than pay for the vessel by way of fuel savings, preliminary studies indicate.

But the Coast Guard is just as interested in the advantages offered by nuclear power for year-round, non-stop operation in the Arctic. In the case of heavily-powered conventional icebreakers working in thick ice, refuelling often must take place every week or two, reducing an already limited working season, which now stretches from early June to late October in the Arctic, says the Coast Guard.

A nuclear-powered icebreaker could be involved in heavier icebreaking duties over longer durations and would be able to stay with vessels traversing the Arctic.

Beside the additional cost and the technical problems associated with nuclear power, perhaps the biggest disadvantage facing Canada is that a light water, slightly enriched nuclear reactor would have to be used in an icebreaker application.

AECL points out that Candu-type reactors are more bulky than light water reactors, and for shipboard use, where a compact reactor is needed, enriched fuel would be required, even in a Candu heavy water reactor.

municipal briefs

A pair of bandits wearing construction hard hats robbed North York Hydro's office of $5,400 in cash and $354,000 in cheques, made out to the utility. Utility treasurer Emmett Campbell told police the men entered by a side door and went directly to the vault where bags containing the money were about to be picked up by an armored truck.

Consultants preparing a report to the Royal Commission on Metro Toronto have recommended the amalgamation of all Hydro systems in Metro under a Metro energy commission. James F. MacLaren Ltd. says an energy commission may provide a way to control future energy use. The most immediate benefit, the firm claims, would be uniform rates for electr cal service throughout Metro.

Scarborough PUC has signed a one-yea agreement giving 400 of its employees a 1 per cent pay increase. The contract, retro active to April 1, covers both water an Hydro department workers. Hydro lineme get an additional 1 per cent on each step t keep them in line with other contrac signed with the International Brotherhoo of Electrical Workers.

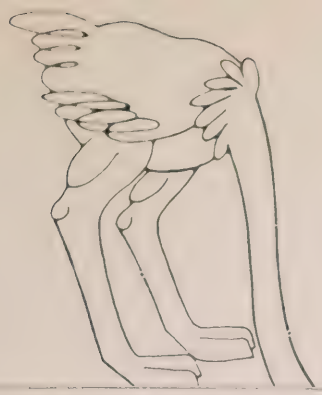
Robert P. Darrell, a former accountant wit Toronto Hydro for 33 years, has died at ag 89. A flying instructor during the Fir World War, it has been said of Mr. Darre that every time he went aloft with a stude pilot, he carried two essentials: pliers tighten wire wing struts that came loose flight, and a heavy wrench to subdue st dents who became panicky at the control

Long-time North Bay Hydro commission Wes Cooke and veteran employee Bo Landrie have been honored by the utility a special reception in North Bay. M Cooke was a former member of the We Ferris Hydro Commission before the tow ship was amalgamated with North Bay a has been a Hydro commissioner for years.

Ontario Hydro's Beamsville area manag R. Greg Wood, has been elected preside of District 5 of the Association of Municip Electrical Utilities. In addition to his duti with Ontario Hydro, Mr. Wood also ma ages Beamsville and Grimsby Hydros.

Listowel PUC's electric department end the 1974 fiscal year with an operating s plus of $22,802, manager William Bell h told his commission. The year before t electric department ended up with a $2,1 deficit.

Espanola Hydro's manager Gerald Delar has been elected president of the Nor eastern Region Association of Munici Electrical Utilities. Others elected inclu Ronald Kidd, Cochrane PUC, vi president; Wayne Attwood, Ontario Hyd North Bay, secretary-treasurer, and dir tors Gilles Legault, Capreol Hydro, a Robert Williams, North Bay Hydro.



as don wright sees it

e went on at some length in our last col-
in about the deficiencies of the British
, or water closet to the untravelled, and
ggested that loolessness in public build-
is was a contributing factor in the
cline and fall of core areas in major U.S.
es. Since then British Columbia has
ved swiftly to ensure that its citizens are
ll served in the matter of relief stations.
e ability to pay will not be allowed to
termine who goes and who has to hold

Johnny-on-the-spot with legislation in
form of the Free Public Toilets Act, the
. government regards coin-operated
angements as discriminatory against
men in that pay-as-you go facilities are
be found more often in the ladies' loo
n in mens'. They intend to end them.
We agree with the government. Why
uld men benefit from their long-
nding habits while women have to pay
their own deep-seated way of doing
gs? Isn't there such a thing as squat-
s' rights?

ut we approach the whole business of
men's rights with a great deal of trepida-
and you out there in the TV audience
have to excuse us if we look a little
py this time around. We were attacked
a swarm of Msquitos as the result of
ne remarks we were foolish enough to
e a while back with regard to Interna-
al Women's Year and the Why Not? slo-
.

Arousing most ire was our use of such
ky phrases as "sweet young thing" and
ar old soul" but "gals" and "ladies"
e other terms raising hackles. Dispense
the synonyms and stick to "person"
med to be the common element in the
plaints. Cowed as we are we can't
ee.

or one thing these aren't necessarily
onyms. Tired and hackneyed expres-
s, perhaps, but we still think them to be
e descriptive than "person" which
e or less embraces every human being
arth.

lot all persons are deal old souls, it
ms to us, but all dear old souls are per-
s. We would not, for example, refer to
writers of some of these letters as sweet young things. In this particular instance the word "person" is probably adequate and even preferable to anything more descriptive.

But the word falls down badly in other instances. We like to see, for example, the words "ladies" and "gentlemen" spelled out over the doors on our public lavoratories. Persons is just a bit too general.

And so we leave a subject we will do our best to avoid in the future. But let's all hang loose and accept the fact that there are subdivisions within the species homo sapiens and without which it would be a dull old world.

■ Anyone interested in a set of well-preserved tracks from a three-toed acrocanthosaurus should write the Texas Utilities Company. The tracks were discovered at the bottom of a 70-foot excavation on the site of the state's first nuclear power station, now under construction.

Seems like this 10-ton member of the dinosaur family had looked the site over several million years ago and left his impressions — each of which measured one foot by two feet. Construction was halted until the prints were cut out and preserved for whatever purpose people use the prints of three-toed acrocanthosauruses.

Wandering around at a time when the fossil fuels now competing with nuclear power were in the early stages of manufacture, it isn't likely Dinny the dino gave much thought to the fission process.

Or did he? French scientists claim to have discovered a natural nuclear reactor which burned spontaneously for more than a million years in central Africa and may have caused spectacular mutations in plant and animal life two billion years ago. A trifle on the grotesque side, old Dinny may have been one of the mutations.

■ And we have that case of the Tanzanian fisherman who sighted a sea monster said to have two legs with toes, two arms with five fingers but no hands, and only one eye. The arms sprouted from the chest and there was one ear and a horn. The creature also sported a hump, a toothless mouth with a large tongue and a beard.

Excitable chaps, these Tanzanians. Getting so a man's mother-in-law can't go for a swim without causing an international incident. Or should that be person-in-law?

■ Topless linemen and bottomless meter readers are the grisly prospects in store for a pleasant little town in southern Ontario as inflation stalks the land.

Free shirts for town utility linemen had been provided as a good will gesture but are being discontinued because of the rising cost of clothing. Pants will continue to be supplied and it will be jackets only for the meter readers.

Less generous than in the past, these concessions seem enough to ensure that utility personnel do not appear in the altogether. It's the meter readers we're worried about. Accustomed to zeroing in on meter mens' pants, neighborhood dogs will be going after other targets.

■ Speaking of dogs, we have a weirdo by way of an occupational safety and health report from Britain. Details are scant but it seems that an electrician was working on cable repairs while being protected from the elements by a tent and from the equipment by rubber matting. At this point a friendly pooch entered the tent and licked the electrician's face. Both man and dog received an electric shock and Fido took off in high gear. The electrician was unhurt — until the dog returned a short while later and bit him!

■ Finally, there is a story going the rounds in one part of the province that Hydro altered the route of one of its transmission lines for fear of disturbing a few spotted turtles. The issue only became more confusing when one newspaper referred to the turtles as red herrings.

Spotted or otherwise, turtles are difficult to mistake for herring, red or otherwise, and we have the word of our people responsible for this sort of thing that they know the difference. Spotted turtles have not yet become a major factor in the route selection process. And certainly not red herrings.

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Robert Crichton, Editor
Isobel Morgan, Design

the cover

Science lessons aren't confined to the classroom as a group of elementary school students on a visit to Ontario Hydro's Pickering nuclear power station can attest. For further information see 'Dear Sir Adam...' beginning on page 10.

Ontario Hydro photo

hydro news, volume 62, number 5

Published by Ontario Hydro, 620 University Ave., Toronto.

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Printed in Canada.

Looking at alternatives

Never before has the future been so clouded insofar as the question of fuel supplies is concerned. Problems of cost, reserves, availability and environmental impact are making life difficult for electrical utilities everywhere in planning the facilities needed to meet power demands a decade and more in advance.

Ontario Hydro is putting the emphasis on nuclear power and this looks to be the most logical direction as developments and circumstances reduce the viability of alternatives.

In moving towards a system in which the fission process will provide the greater part of its capacity, Hydro has the full support of government. This was reiterated recently by Energy Minister Dennis Timbrell.

Speaking to representatives of the communities in the vicinity of the Bruce nuclear power development, in July, the Minister referred to the Candu reactor as the best hope of producing electric power at something like a reasonable cost.

"Accordingly," Mr. Timbrell said, "my Ministry is offering every encouragement to Ontario Hydro to concentrate on a nuclear program so far as future expansion plans are concerned."

The alternatives, if they really are that, are not attractive. Most water power sites have been developed and this form of energy cannot contribute substantially to system expansion in the future. Oil and gas are in limited supply, their costs are spiralling and opinion is growing that they can be used to better advantage in applications other than the production of electricity.

Coal is far more abundant but its availability at prices this province can live with or major additions to generating capacity is much in doubt. Prices have been soaring and are likely to continue upwards as the squeeze on oil and gas taxes the capacity of the coal industry to meet demands.

Fortunately, this seems like one instance where the most tenable course is the best course – all things considered.

Fuel for the nuclear program is available here in the province and, with intelligent policies as to its disposition, in sufficient quantities to meet local requirements for the foreseeable future.

Of all forms of thermal generation, nuclear power has the least impact on the environment. It is also the cheapest – recognizing that today's nuclear plants are designed for continuous base load operation and that other forms of generation are needed to meet peak requirements.

And from a conservation point of view, each nuclear station represents a saving of many millions of barrels of oil or tons of coal over its lifetime. As a natural resource, uranium isn't very useful other than for the production of electricity or perhaps steam for heating or industrial processing.

Opponents of nuclear power say it should be replaced by such resources as wind and solar power and geothermal energy. These are not real alternatives at the present time and it is irresponsible to suggest that they can substantially alleviate the energy crunch over the next decade or so.

This is not to suggest that the nuclear way is without problems. Capital cost is one. Nuclear stations cost almost twice as much to build as conventional thermal plants and while they are cheaper over the life of the installation, the vast sums needed for system expansion are a matter of great concern.

Long-term spent fuel storage is another problem. The underwater method currently in use at station sites is only an interim measure and provision must be made for permanent storage of the extremely long-lived radioactive elements present in spent fuel. Solutions are available and it's more a question of selecting safe methods which add the least to the cost of power.

The present situation in this province may be compared to that which existed at the turn of the century. Coal was the chief source of industrial power and Ontario was a have-not province.

This changed with the advent of electricity and the economic prosperity which followed was largely based on the power of great rivers. With little hydro-electric power remaining to be exploited the province is once again dependent on outside resources for most of its energy needs.

Uranium and nuclear power hold out much the same promise as the rivers did more than half a century ago. Both the fuel and technology are available and they appear as a bright light in an otherwise bleak energy picture.

A possible stumbling block to the full realization of the nuclear potential is public opposition. Not yet apparent on the scale which has developed in the United States, Japan and several European countries, the anti-nuclear sentiment is very much alive in Canada with some evidence of growing strength.

There is an onus on the nuclear industry here to ensure that the public is well enough informed to base its judgments on knowledge and to recognize emotional appeals without substantiation for what they are. Such a public is likely to expect those opposed to nuclear power to take a more responsible part in reaching socially acceptable solutions and realistic alternatives. □

conservation begins at home

by Sheila Kenyon

If people in Ontario today utilized all available knowledge respecting conservation of energy, the captain in the kitchen could run a very tight ship. By making a habit of some simple energy-saving ideas, food dollars and fuel bills can be conserved – and energy saved too.

One of the biggest challenges facing Ontario Hydro, and the federal and provincial governments, is to persuade people to participate in energy saving programs. It is not easy to change long-established customs and habits – but it is essential that attitudes and lifestyles change to some extent.

"We've lived far too long in an affluent society. It won't be easy, but we have to influence people to think in an entirely different way," says Gary Pepper, manager of Hydro's Customer Applications department. This is exactly what Hydro's "Wise Use of Energy" program has been doing since 1973. Hydro has been concentrating on telling the public how they can conserve electric energy to help themselves and other Ontarians.

Many kitchen captains have already become efficiency experts at saving time through wise use of electrical appliances. Now they must be recruited to meet the conservation challenge.

With so many women now in the work force – 35 per cent of Ontario's work force was female in 1973 and by 1980 it is expected to reach 50 per cent – the modern woman has become an efficient manager, conserving family income and managing hard-earned dollars. Today, women do not spend the time they once did in the kitchen looking after household chores. Washers, dryers, dishwashers and vacuum cleaners have removed the drudgery from housework, releasing women to follow careers, devote time to volunteer programs, or acquire further education. Women have learned not to waste their time.

Now they can take a lead in conserving some of the energy Canadians are wasting. Roy Durham, an industrial specialist in Hydro's Customer Services division, estimates that 60 per cent of the energy used in Ontario is wasted. This wastage has come about because people have never concentrated on the need to conserve it.

How can people learn to save at least some of the money they are losing through this waste? One way is by supporting Ontario Hydro's "Wise Use of Energy" program. Homemakers are advised of valuable and simple savings that can be achieved through wise use of energy in the kitchen:

– By using pots and pans that fit the stove element so heat isn't lost around the sides of the pan.
– By not drowning vegetables – less water boils more quickly.
– By planning to cook a complete oven meal whenever the oven has to be on.
– By using a dishwasher once a day and letting dishes dry in the air once the wash cycle is over.

Many busy career women are investing in microwave ovens to cut meal preparation time. Residential and commercial sales are expected to reach 30,000 in 1975. A microwave oven costs six cents an hour to operate – the same as a standard oven. The conservation bonus is that cooking time is much less. However, a user must be pretty skilled and know the oven's limitations. "Five seconds, too much, can ruin a steak," says a leading restaurant owner. And for some foods – roasts, for example – the results achieved in a standard oven seem to be preferred by most people.

Householders are also asked to take good look at the layout of the kitchen. Is the refrigerator at least four feet from th oven? This is the distance that should se arate the two appliances, says Al Longo past president of the Toronto Home Buil ers' Association. If it is less than that the oven may significantly increase the worl the refrigerator has to do and therefore increase its energy consumption.

Freezers should be located in the coo est area of the house or apartment. Man more Canadians are investing in home freezers to combat rising food prices. Pe ple have varying opinions as to how muc money can really be saved through free use – but most freezer owners agree yo can save money.

Rural home food freezer owners, wh grow their own fruit and vegetables, hav an advantage over urban dwellers. But v many city dwellers enthusiastically grow more vegetables in their own gardens a public allotments, many people can har vest food for freezing (see Plotting to Improve Rights-of-Way, Hydro News, Ju August).

The Ontario Ministry of Agriculture a Food has just issued an up-to-date publ tion on frozen foods, which is invaluable for the freezer owner. The Ministry says freezer size should relate to the size of each family – a good rule of thumb is to allow five to six cubic feet per person.

Freezing instructions for fruit and veg tables should be followed carefully. The Ministry of Agriculture publishes a leafle "Timing Best Buys for Ontario Fruits an Vegetables," which tells which varieties fruit and vegetables are suitable for tabl

appliances: wattage ratings, annual consumption and operating costs

electrical appliance	rating (watts)	average annual consumption (KWH)	municipal residents (cost/KWH estimated at 1.3 cents) operating costs per hour (cents)	1 cent will operate for	average annual operating cost
kitchen					
broiler	1,500	100	1.95	31 min.	$ 1.30
deep fat fryer	1,500	65	1.95	31 min.	$ 0.85
dishwasher	1,300	200	1.69	36 min.	$ 2.60
freezer (15 cu. ft.)	335	900	0.218	4 hrs. 35 min.	$11.70
range - top elements	7,500	1,150	9.75	6 min.	$14.95
- oven	3,750		4.875	12 min.	
refrigerator (12 cu. ft.)	300	700	0.195	5 hrs. 8 min.	$ 9.10
toaster	1,150	40	1.495	40 min.	$ 0.52
entertainment					
hi-fi - tube type	115	—	0.146	6 hrs. 51 min.	
- solid state	30	—	0.039	25 hrs. 38 min.	
radio - tube type	50	100	0.065	15 hrs. 23 min.	$ 1.30
- solid state	5	10	0.007	142 hrs. 51 min.	$ 0.13
tape recorder	20		0.026	38 hrs. 28 min.	
television - black & white	200	370	0.26	3 hrs. 51 min.	$ 4.81
- color	330	450	0.429	2 hrs. 20 min.	$ 5.85
laundry					
clothes dryer	4,500	600	5.85	10 min.	$ 7.80
iron (hand)	1,250	75	1.214	49 min.	$ 0.98
washer - wringer	300	50	0.39	2 hrs. 34 min.	$ 0.65
- automatic	700	90	0.91	1 hr. 6 min.	$ 1.17
comfort					
air conditioner	1,200	400	1.56	39 min.	$ 5.20
dehumidifier	265	380	0.345	2 hrs. 54 min.	$ 4.94
electric blanket	190	115	0.099	10 hrs. 6 min.	$ 1.50
fan	115	—	0.15	6 hrs. 40 min.	
humidifier	80	480	0.104	9 hrs. 37 min.	$ 6.24
miscellaneous					
clock heater	500	480	0.65	1 hr. 32 min.	$ 6.24
clock	2	18	0.003	333 hrs. 20 min.	$ 0.23
hair dryer	375	5	0.488	2 hrs. 3 min.	$ 0.07
lawn mower	1,500	—	1.95	31 min.	
power saw	275	12	0.358	2 hrs. 48 min.	$ 0.16
vacuum	800	20	1.04	58 min.	$ 0.26

use, canning and freezing. Local agriculture representatives or extension offices will also advise the public on varieties for freezing.

To utilize a freezer and save money on food, supermarket "specials" come in handy. The freezer owner has the advantage of buying specials in quantity and saving on food costs.

"Convenience" frozen foods, although they do not appear to have an immediate cost savings like "special" buys, can save the homemaker valuable time. By purchasing large bags of vegetables like peas and carrots portions can be judged accurately so that there is little table wastage. Frozen food has become of increasing importance to the food industry. One supermarket chain provides more than 400 frozen food items, compared with 266 in 1973.

Purchasers of a side of beef or other meat in quantity are advised to deal with a reliable butcher or supermarket, and to shop around to determine what prices are available. Like businesses, the buyer doesn't have to take the lowest tender. The purchaser should see the side or carcass before buying it and check for the federal inspection legend or Ontario inspection legend – a guarantee that the meat has come from a healthy animal. The butcher can cut the carcass into roast sizes suitable for different families. As well, "special" meat buys and "special" poultry buys can be stored in the freezer to provide a good selection and save money.

The temperature in a freezer or freezer cabinet should be -18 degrees C or less – and the freezer should be kept filled to conserve energy and use it most efficiently.

The trick to conserving energy in the kitchen and dollars through wise food purchases is not simply to listen to tips from other people. It is to develop an entirely new attitude of mind so that individuals think up their own methods of saving energy and conserving money.

Although the lady of the house has an important role to play in conservation of energy the onus does not fall entirely on her shoulders. Federal Energy Minister Donald S. MacDonald expects industry, commercial and the transportation sectors of the economy to share the challenge.

The electrical appliance manufacturers have already taken up the challenge. They are involved in studies which they feel will have far reaching effects on the development of electrical products. Recently, the Canadian Standards Association established a new Sectional Committee on Performance of Electrical Products. The committee is composed of 17 members representing consumer groups, electrical contractors, appliance manufacturers, the federal and provincial governments and retailers. R.E. Olley, of the Consumers' Association of Canada, Saskatoon, is the treasurer; Hydro's Gary Pepper is a representative for the Canadian Electrical Association.

One of SCOPEP's mandates is to study the performance of electrical products and set standards for the labelling program of the Federal Department of Consumer and Corporate Affairs. This labelling program, called CANTAG, is expected in a year or two to provide information tags on refrigerators, air conditioners, ranges, washers, dryers and other electrical appliances. The CANTAG label will assist the buyer by allowing him to compare capacity, energy consumption, performance and installation.

While the government is planning labelling, the manufacturers are improving the energy saving properties of their appliances. New technology is being incorporated into refrigerator design already, says E.J. Von Arb, vice-president of engineering, Inglis Limited. He represents the Canadian Appliance Manufacturers' Association on SCOPEP.

By 1978, according to Mr. Von Arb, we will see considerable change in refrigerator design, with the use of polyurethane foam for insulation. Not only will it provide better insulation, but the foam is more compact, making it possible to increase the interior capacity of the refrigerator.

Once standards for refrigerator performance have been established it will probably mean the introduction of a rigid inspection program to ensure that all refrigerators manufactured in Canada or imported meet Canadian performance standards.

SCOPEP is also studying vacuum cleaners, freezers, lawn mowers and audio amplifiers as well as a wide range of other products.

These new standards and performance standards will enable the purchaser to be far more knowledgable about the consumption of electricity of each product brand. The kitchen is one of the biggest energy users in the home and habits formed in the kitchen will influence conservation habits. During this century we have been wasting energy with an extravagance that can never be allowed to happen again. Countries like France and Britain, hard hit by the world fuel crunch and escalating prices, have already begun cutting back. They have developed heat storage devices and improved the efficiency of their electric use patterns. Britain has offered residential consumers lower rates during low demand periods.

The United States is examining if it could change the habits of residential customers. A Connecticut power company is investigating whether consumers would alter their habits to reduce power costs. The experiment, financed by the Federal Energy Administration, would revolutionize power use patterns in the home, such as doing the wash or dishes after midnight.

Attitudes towards conserving energy will have to change – and this is already happening. Luckily, this will also conserve money too. So, as those two dumb animals, the mutt and the Afghan hound – say in the Hydro television commericial: "Offf! Offf! The first time an unnecessary light is turned off is the first step in becoming an energy conserver.

Hydro's persuasion program

Ontario Hydro's going to the dogs to get across the idea of energy conservation on television.

The dogs are two puppets – an aristocratic Afghan, and a plain mutt – who appear in a Hydro commercial on prime time TV programs.

It closes with a dog's bark, which comes across as "Offf!, Offf!" and a clear message: please turn off those doggone unused lights and appliances to save energy.

The puppet pooches add a dash of humor to a wide-ranging Hydro program, which includes advertising and other measures to foster conservation of all forms of energy, including electricity.

Spot radio commercials are aired daily mainly during the peak listening hours of the morning. They urge Ontario residents to insulate their homes, replace faulty tap washers and insulate pipes to save hot water, and to pull the drapes across the windows to reduce the load on air conditioners.

One conservation message – aimed at the complacent – says that even in a well-insulated home up to 25 per cent of the heat loss could occur around windows and doors and urges homeowners to caulk them or to install new weatherstripping.

Ads giving specific information on how to conserve energy (and save money) are also appearing in daily newspapers, while selected business and professional publications are used to reach industrial plant and office managers and designers of commercial buildings and schools.

Farmers aren't being forgotten either. If they insulate their hog barns, says a new ad, a well-stocked building may require no supplementary heat at all. The reason: each 125-pound hog generates 400 BTUs an hour.

Besides direct advertising, Hydro is carrying out other forms of consumer education. In the past two years, nearly 1,000,000 copies of a slim leaflet called "The Wise Use of Electricity" have been distributed by Ontario Hydro and the associated municipal utilities. Some PUCs have delivered it to all their customers.

It's full of simple, commonsense tips that will help eliminate wasted energy. Additional booklets have been produced to give detailed instructions on home insulation, on how to make the most efficient use of air conditioners or fans, and on other ways to conserve energy throughout the home.

The idea is that if we all save a little, we can all save a lot.

Other aspects of the conserve-energy program have picked up a lot of momentum since Hydro began it in 1973.

*During 1974, energy management symposiums were conducted all over the province for representatives of industry. More than 1,000 plant engineers attended to learn methods of conserving energy.

This year, similar symposiums have been conducted for senior management of Ontario firms in Woodstock, Barrie, Kingston and London in co-operation with municipal electric utilities. A new round of sessions is scheduled for plant engineers this fall to discuss energy waste, efficient lighting, waste heat reclamation, and how to run an in-plant energy conservation committee and make an energy audit.

*Hydro specialists are working directly with architects, design engineers and developers of office and other commercial buildings to encourage designs that incorporate the most efficient uses of the energy needed to operate them.

*Agricultural applications representatives are continuing programs designed to advise farmers and farm groups on how to make wise use of energy. In many cases Hydro has helped farmers to avoid installation of new electrical capacity in farm buildings by taking into consideration ways of conserving electricity and other forms of energy.

*Hydro has been working with federal and provincial officials in an effort to promote improved insulation standards such as those developed for electrically-heated homes.

Reductions in power demands in the U.S. have been attributed in part to efforts by U.S. utility systems to promote energy conservation, but so far there has been no discernible response in Ontario. However, Hydro is planning to monitor power use in several subdivisions this year to assess the effects of its conservation program.

As a group, industries are the largest users of electric power in the province. Are meetings with plant engineers and industrialist achieving results?

"It may take some time to instigate energy conservation because industries run on annual budgets," says Roy Durham, a Hydro industrial applications specialist. "But we are working for long-term changes in attitudes toward energy use."

However, industries have shown strong interest in meetings he has attended.

Mr. Durham has presented an illustrated talk called "The Energy Dilemma is Now" to major corporations, government agencies, service clubs and utility groups. A major oil firm was so impressed that his talk was videotaped in color and screened at its refineries across Canada.

Ontario's catalyst for action

In a bid to cut back Ontario's growth rate in energy consumption by one-third by 1980 – a saving of $1 billion a year by then – the provincial government has established a major energy management program.

Twelve ministries are involved in the program, which is being co-ordinated and funded by the Ministry of Energy.

But it won't be limited to government activities, says Energy Minister Dennis Timbrell. His ministry is to act as "the catalyst for positive action" by government, industry and the general public to moderate the growth rate in all sectors of the economy.

Mr. Timbrell has forecast that energy spending in Ontario will reach $5.6 billion this year and could double by 1980.

Objectives in the conservation program include:

*Providing operational management assistance to industry, business and commerce – with some special attention in the construction and transportation fields. This will include giving technical demonstrations to these areas and the public showing practical, proven applications of energy-saving technology.

*Encouraging energy conservation in farming and related industries and services. Attention will be given to greenhouse operations, corn and tobacco drying, ventilation and heating of farm buildings, and assessing energy aspects of new production techniques.

*Introducing thermal performance standards for new construction in the Ontario Building Code.

*Introducing subjects dealing with conservation in school courses.

*Demonstrating to citizens that environmental improvement is related to energy conservation, and showing that there is a net savings potential in recycling products and reclaiming waste material.

*Promoting more efficient use of government vehicles, lighting, snow melting systems, building maintenance, building electrical systems, building operations and preventive maintenance.

*Evaluating the need for financial incentives to encourage better energy management.

*Establishing energy management guidelines for the operation and maintenance of 75,000 public housing units, and experimenting with new sources of energy in residences through solar housing designed to store the sun's energy.

*Providing assistance, information and technical data to industry at the plant level and conducting conservation seminars through regional offices.

*Determining and evaluating efficient fuel saving methods through analysis and testing, and specification and design modifications.

*Establishing research and development programs into better energy use in new products, and processes such as the study of district heating using energy available at night from nuclear generating stations.

*Offering guidance in improving heating efficiency in schools and college and university buildings by examining such areas as ventilation, air conditioning, lighting and heating.

A test has already been set up for this fall in the last area: two schools in Cambridge – Ryerson and Alison Park junior public schools – will be used in the pilot plan.

Both were built in 1965 and have simil amounts of floor space and exterior glas exposure. Because of initiatives taken by the Waterloo County Board of Education both are currently operating as efficiently as possible.

The Ministry of Education plans to reir sulate Ryerson school to determine an et ciency factor of construction and the rea cost benefits of "retrofitting" existing buildings with modern insulation materia Alison Park school will serve as the basis for measuring the success of the insulati test, which will be carried out over a thre to-five year period.

In another Ministry of Education plan, students will be encouraged to perform voluntary energy "audits" in their own homes. The audits are expected to be treated as special projects in science-related courses across the province. □



Heat transport pump, used to push heavy water through reactor channels, dwarfs man at Bruce nuclear station.

Powerful pumps face tough tests

A Bruce heat transport pump packs four imes as much power as a heavy-duty diesel locomotive. Bruce "A" generating station has four of them for each of its four '50-MW reactors, and each pump develops up to 12,000 horsepower (8,972 kW).

A motor-pump assembly stands about 15 feet high and weighs nearly 65 tons. The four pumps push 220 gallons of heavy water a minute through each of the reactor's 480 fuel channels.

Pickering generating station has 16 relatively small pumps per reactor, four of which are spares, but Bruce has no standby pumps. If a Bruce pump breaks down, reactor output will be reduced to 68 per cent of full power.

Larger pumps were installed at Bruce as one of a number of measures taken to reduce capital costs, but experience has shown the need for further testing and development.

That's why Hydro is building a major pump testing complex at its W.P. Dobson research laboratory in Etobicoke: highly reliable performance is essential. The Bruce heat transport pump sets are too large to be tested at Atomic Energy of Canada's research facilities at Sheridan Park and manufacturer performance testing is considered inadequate to ensure reliability.

Hydro also hopes to encourage competitive bidding in the Canadian market for the pump sets and other equipment.

Reliability standards are highly demanding. They allow only 11 full power hours attributable to forced outages per year for all four heat transport pumps in a single unit. Hydro also has stringent requirements to avoid leakage of expensive heavy water through the pump seals.

The pump testing complex, to be located behind the research laboratory on Kipling avenue, will have a test bay 220 feet long, 80 feet wide and 80 feet high. An additional wing for small laboratories, a control room and offices will run the length of the building.

The bay will house a test pump set and piping loops for circulating hot, pressurized light water. The test unit will operate at the normal operating temperature for a Bruce pump (266°C), but the only source of heat input will be the pump itself.

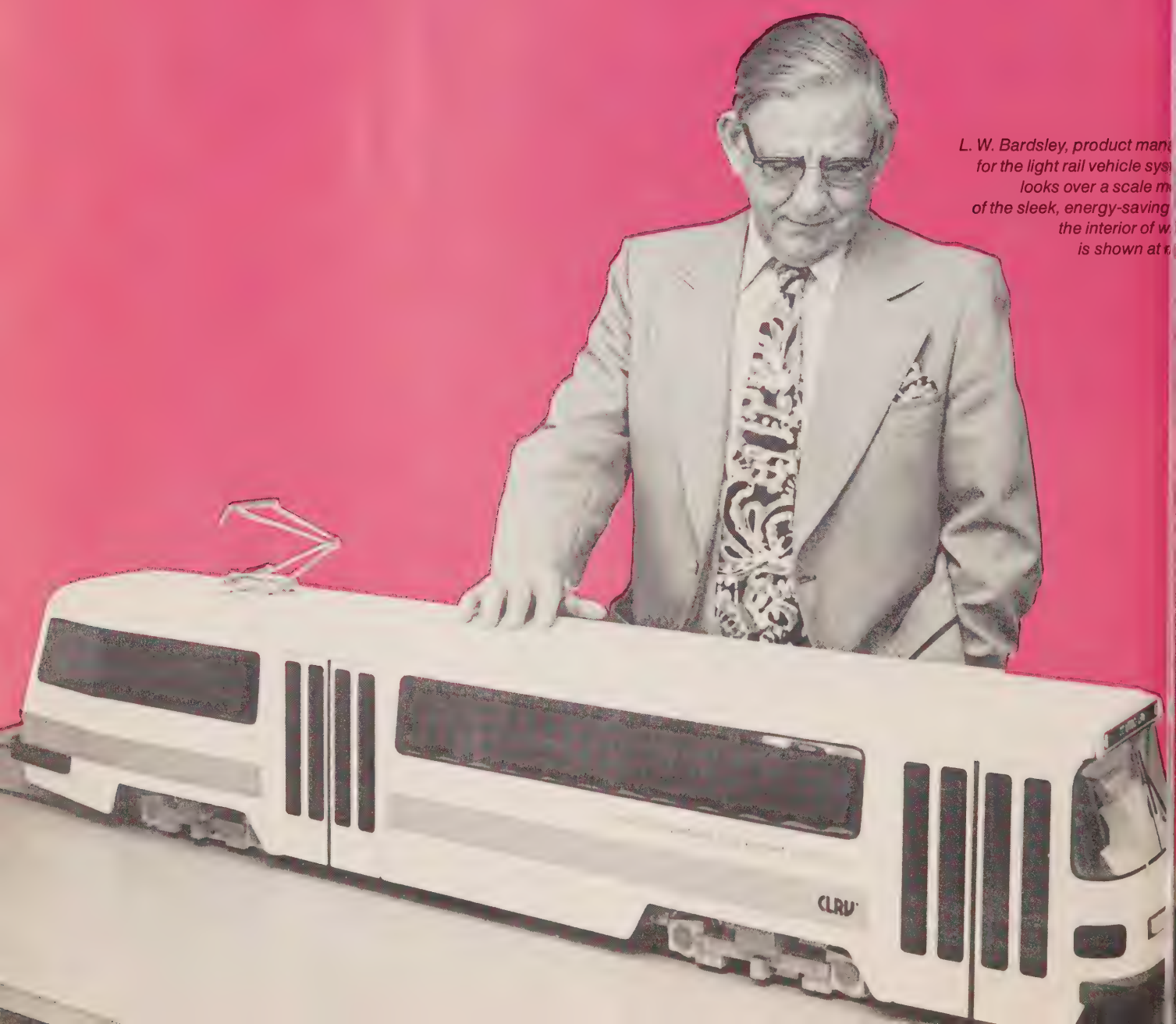
Various plans are being considered for making use of waste heat from the pump test loop, which is scheduled for operation in the summer of 1976.

Space will also be provided for eventual testing of large boiler feed pumps for fossil-fuelled stations. By the early 1980s Hydro expects to do its own performance testing on these pumps to prevent costly delays in deliveries such as it has experienced in recent years.

The pump testing complex is expected to grow in importance as nuclear power assumes a growing role in meeting Ontario's power demands. It will operate around the clock, seven days a week.

By increasing the availability of Bruce "A" and future nuclear stations for power output, the new facility is expected to pay for itself within a few years. The first Bruce "A" unit is scheduled for service early next year. □

On the right track for saving energy



L. W. Bardsley, product mana
for the light rail vehicle syst
looks over a scale m
of the sleek, energy-saving
the interior of w
is shown at

A new breed of Canadian-built streetcar that can cut electric power requirements by at least one-third will appear on Toronto streets in 1977.

Two hundred of the new streetcars, more correctly named light rail transit vehicles by the provincial government's Urban Transportation Development Corporation, will be ordered by the Toronto Transit Commission. The first cars will be built early in 1976.

The average observer will likely be



impressed by the streamlined cars with such features as a lower access step, wide doors, big windows, brightly-lit interiors and individual seats. But designers are more enthusiastic about the technical aspects of their brainchild.

The Canadian light rail vehicle can be equipped with an energy-saving device known as a chopper, which literally chops incoming electricity for better distribution to the propulsion system, much like a carburetor controls the flow of gasoline in an automobile engine.

In existing streetcars the full flow of electricity is fed to the motors and the unused portion becomes waste heat.

L.G. Main, vice-president of marketing and sales for the UTDC, says the chopper control would cut electric energy consumption on the vehicle by 33 per cent. "That's a major consideration nowadays," he said.

Electric energy will also be returned or regenerated in what is called a receptive power distribution system during vehicle braking, thus conserving more energy.

The chopper control system has been used on an experimental six-car Toronto subway train for the past three years and has shown promising results.

Jack Harvey, manager of subway construction, says the device is a solid state control system originally developed and used on an extensive fleet of rapid transit vehicles in Japan.

So pleased is he with the testing program that choppers will be built into 134 subway cars now on order.

Mr. Harvey estimates the chopper will save 11 million kilowatt-hours of energy per year on the subway system. That's enough to provide electricity for 1,400 homes with an average consumption of 750 kilowatt-hours per month.

Comparable savings can be anticipated from the lighter streetcars, depending on the number of miles they travel.

Another advantage is a smoother ride because of steadier acceleration and deceleration. And it's anticipated that maintenance costs of chopper-type controls will be less than that for conventional rheostat controls.

The UTDC considered the subway experiments when designing the new streetcar. In fact, L.W. Bardsley, product manager for the light rail project, and manager of the TTC equipment department for many years, was a guiding force behind the recent project to rebuild the system's fleet of trolley coaches. Several other TTC officials are also on loan to the UTDC.

Another feature of the new streetcar is an improved resilient wheel design and suspension system for a quieter ride. Noise levels will be reduced by as much as 10 decibels outside the vehicle. Acoustical treatment of the car structure will make the ride quieter for the passengers.

The first vehicles to be ordered by Toronto will be four-axle single units with seats for about 50 passengers. The coaches will be capable of being linked together in six-car trains under the control of a single operator.

The design concept also provides for two other coaches – a six-axle, 75-foot articulated version that bends in the middle and a 100-foot train car. Both would operate on private rights-of-way.

All three variations can be produced with two or three doors or for double-ended operation. They are to be adaptable to automatic or honor fare systems and to rapid platform loading. Speeds up to 70 miles an hour are proposed for separate right-of-way operations.

Initially the vehicles will operate on existing streetcar tracks when they join the TTC fleet in 1977 and 1978. But UTDC officials are hopeful that they'll also be used in the train mode on railway or Hydro rights-of-way.

One of the areas being considered for this concept is along a CNR line running from the eastern subway terminus to be built at Kennedy road and Eglinton avenue, to Scarborough Town Centre and possibly in the future the Metro Zoo and the Malvern area.

The new streetcar won't replace other forms of mass urban transport. As Mr. Main told the American Public Transit Association's Rapid Transit Conference in Washington in April, "LRT is not the answer for all locations in all cities. But we are convinced that light rail transit is becoming recognized as an efficient economical alternative for meeting the transportation objectives of many cities in North America, and throughout the industrialized world." □

'Dear Sir Adam...'

by Rae Hopkins

Thurs Mar. 20 (1975)
Dear Sir Adam Beck
I am doing a project on Niagara Falls and the Wellandcanal. I would be very happy if you would send me a map of them. I am sorry if it is alot of trouble for you but I need the information badly. I am in grade three.
By any chance you are the wrong person could you send it to the right person.
Thankyou
Yours sincerely
Debbie Adam.

So read little Debbie's note, lettered in a hand that gives the impression that she's much more advanced than a child in grade three.

Then there was the typewritten letter from a student in North Bay advising that he was doing a "major project" on nuclear energy.

The writer went on to say that "in one of my books there is an experiment showing an effect of various kinds of radiation.

"I would like to do this experiment," he wrote, "but to do so I need a piece of radioactive material. Is it possible for you or some other company to give me such an item of such a low radioactivity that it would not be a great danger, but serve my purpose, and instructions to dispose of it.

"If these favors could be done, I would be substantially indebt to you," the letter concluded.

It was television personality Art Linkletter who first said it . . . "Kids say the darndest things."

Even so, they're serious, and requests for assistance with school projects are about as commonplace around Ontario Hydro as textbooks are in a classroom.

And the letters and telephone calls pour in from almost all ages, starting at the grade three level through to post-graduate university students.

They want information on topics ranging from how electricity is made at Niagara Falls to pollution and pollution control.

For instance, a letter from a year six student in Burlington, read:

Dear Sirs
Our year six class it studying about pollution and I was told that you have sor imformation on it. So I wouldered if you could send me some lidiature on pollutic I know you are busy but anything would helpfull.
Yours truly

The letters seeking help for school assignments come not only from Ontario but from students across Canada and fr around the world.

Carl Bissonette of St. Victor, Saskatch wan, wrote to say he and his grade five classmates in Willow Bunch school are working on a project on "hydro power in Ontario," and that they would like some free information, photos and pamphlets electricity and how it is produced in Ontario.

From Nigeria came three letters, two which were from the same boy, who wro initially:

Onterio Hydro
620 University Avenue
Toronto Canada
Dear Sir,
I have the most respectful for my writ





Whether it's a visit to Pickering generating station for an insight into a nuclear power plant, left and right, or a hair-raising experience for Laurie Busby, centre, at the Ontario Science Centre, Hydro is always willin to lend a helping hand to kids with school projects.

When children ask for help with their science projects, Hydro is quick to respond

you this letter of which I think the letter will meet you in a good condition of health. It makes me to be very happy when I got your address from some one and the person told me how you people help him and truely all the books you people send to him, he showed me. And when I go through some pages of the book I was totaly interested.

So I kindly please you to help me and send me the books that will be more better than my friend's own.

Please sir, do not fail me.

I also beg you to send me more of your address on your replying me.

May God be with you all. Amen.

Thanks,

Yours faithfuly

In a follow-up letter after receiving a package of literature from Hydro's public relations division, he wrote:

Dear Friend,

Your pasol to me was received and when I go through some of the books, in fact I was very very greatful. Most expecially "THE GIFT OF NATURE" I got finished of it before I reply this letter to you. Dear Friend I can boadly tell you that since I started my schooling under Electrical department our master have never one day tought us as you have tought me inside the book called "The gift of Nature." Thank you very much for showing me the IN and OUT of Electricity.

You have not see me before, you only saw my letter I manage wrote to you and you didn't overlook me and my letter and on your replying me you make many things that will make me to be happy and my mind has been full of joy since I got your book.

Infact you have now prove to me to be more capable on electricity. OH! FRIEND. May Almightly God be with you, with your co workers and with all family too Amen.

On your letter to me you said that if I am still interested to have more knoledge from you that I should let you know. Please Sir, I want you to send me more booklets better than "The gift of Nature." May God be with you.

Thanks,

Yours faithfuly Friend.

From the same nation came a letter addressed to:

Available from Ontario
Hydro 620 University
Ave Toronto Ontario

which read:

Sir,

I am very happy to write you this letter. You should not be surprise to receive my letter in this form, please Sir I beg you to send me some of your electrical Books which you know that it will useful to me. If you send it to me I will be very Greatful. If you send it to me, May God be with you Sir. Reply me in time. I send Greeting to you all.

I am your Obident
boy.

Hydro's expertise – and its willingness to lend a hand to the school kids so they can complete their projects – is known the world over.

But the assistance to schools goes much deeper than just mailing a selected package of pamphlets and booklets to the kids who write in or call.

A comprehensive program of resources



dealing with all facets of the electric energy industry are available on loan to the province's 100,000 teachers. These resources are geared to various teaching levels of the education system.

Author and co-ordinator J.M. Black, who has some teaching background, says the program was developed to provide teachers with current and factual information dealing with the social, economic and technical aspects of the electric energy industry.

For example, the resource unit for elementary teachers includes a model which the students can build in their classroom. The model deals with urban and rural concepts, resource uses, transportation and other aspects of community development, as well as an electric energy system to supply electrical requirements.

And for the senior level teachers, resources dealing with electric energy, water resources, technology and nuclear technology are available which are geared to a broad range of subject or thematic study area requirements.

As another public service, Hydro sponsors displays, which depict the story of electric power in the province in many locations, one of the most noteworthy being the Ontario Science Centre.

The Science Centre attracts thousands of school children like Laurie Busby and her best friend, Hilda Tasci, both June graduates from North York's Forest Manor Public School.

On a hot June morning they left the classroom "to learn something about electricity at the Science Centre" so they could complete what would be their final major project in elementary school.

They toured the darkened rain cycle area – an exhibit which depicts how falling water from the skies fills lakes and rivers and how falling water from these natural reservoirs is used to drive the turbines that spin the generators to produce electricity.

They toured all the exhibits, taking notes on what the information panels had to say, and twice they watched and participated in the high-voltage demonstration.

As for their projects, they were unsure what they would write, but they came to conclusion that society couldn't functio without an adequate supply of reliable electric power.

And at Pickering generating station a group of 27 level six students with teach John Cox sat attentively while blonde guide Erika Anne Cook asked how muc they knew about electricity.

Collectively, they answered "a lot."

Q: Well, what is it?

A: It runs on wires.

So went the questions. And there we others, like:

Q: How do you boil water?

A: In a kettle.

Q: Where do you get the electricity fo the kettle?

A: From coal.

Q: Where do you get the coal from (l one of the girls try for an answer).

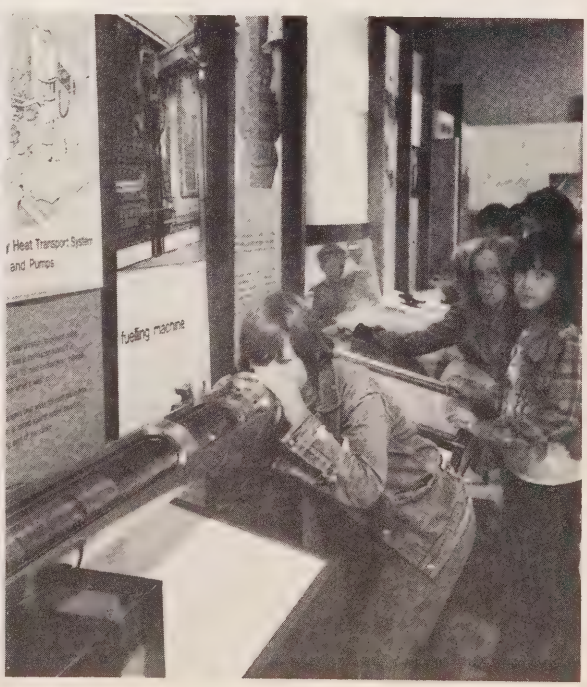
A: From coal mines.

Q: Where are the coal mines?

A: Cape Breton Island and the Unite States.

The students knew that one of the





Audience participation is the key to Ontario Hydro's exhibits at both the Ontario Science Centre, left, and at the information centre at Pickering nuclea power station, where a student peers into a replica of the fuel channel that feeds uranium to the reactor's core.

It was a day of discovery for Hilda T when she went to the Ontario Science Ce to learn what she could about electr And for a group of 27 students Toronto's Withrow School, it was somet similar when they visited Ont Pickering nuclear power sta

smallest things in the world is an atom and hat "six and 21 zeroes" atoms would fit on he head of a pin.

A little math crept into the trip too, when hey had to put six and 21 zeroes into plain anguage. (6×10^{21} or six billion trillion, we hink.)

Students at Withrow School come from a wide range of national backgrounds and or them, said Mr. Cox, a tour of a plant such as Pickering is a particularly valuable experience in the learning process.

For example, he explained, "Hydro" has different meanings for many of his charges: to some of them it still means water. To others it means electricity.

And an unexpected bonus in learning occurred on this field trip. After the preparatory energy lesson, during the follow-up discussion period, a group of Brazilians, nterested in the operation of a Candu reactor, appeared on the scene.

Most of the children thought that because they came from Latin America 'where it's hot all the time," the Brazilians would be much more dark complexioned.

In the discussion period, they talked about energy concerns, the conservation ethic and a whole array of topics that flow out of a field trip to a nuclear power plant, which Mr. Cox believes is an integral part of the learning experience of a group of 12-year-olds.

And some of them completed journals as a permanent record of their visit to Pickering.

One of them read:

Last Tues. we went to the Pickering Nuclear Power Plant. It was nice there. When we walked in we went into the auditorium. Then this lady talked to us about the plant. After we saw a movie about it we walked out and looked at some models of the plant.

Mostly all the kids in our class thought we would get a tour inside but we didn't. After we left and had lunch in the park. After lunch we were on our way home and we saw a mother duck and her eight babies.

Many others expressed the same surprise – that a family of ducks could make its home around one of the world's largest nuclear power plants.

But perhaps this letter from Dixie Neumann (who left no forwarding address) best typifies what school projects and Ontario Hydro are all about:

Dear Sirs:

A while ago I picked Ontario Hydro for my topic for a project. I sent to you for some information. I received it real fast. Thankyou very much. Thanks to all those information packed pamphlets my teacher liked my project so much that he gave it an A+++!

While doing the project I became very interested in how electricity is created. I think everyone should know. If you happen to have any additional information could you please send me some? Thankyou again.

Yours Sincerely,

Indeed, Mr. Linkletter, kids *do* say the darndest things.

But most of them are darned nice – and darned serious. □







eye in the sky

by Robert Crichton



When Ontario Hydro wants to know what route to take, it needs the over-all picture.

And that, literally, is what it gets from the photogrammetric production section of the survey department of Hydro's Transmission & Distribution Projects division.

Spelled out by photogrammetric production officer John Clements, aerial surveying is a part of photogrammetry, which is the "science or art of obtaining reliable measurements from photographs."

This form of aerial surveying is more than just taking photographs from the air. It involves aerial photography planning, mosaics, compilation of environmental data, mapping, route selection, and various engineering studies, among other activities.

And although Hydro's been in the business of aerial surveying since the 1930s, never before has photogrammetry been so important to Hydro operations as now.

Surveying has always played a critical role in getting power to the people but the new factor that's so vital is wrapped up in two words: environmental studies.

At one time, the demands from surveying – both on land and from the air – were relatively simple. All the engineers wanted to know about the route for a transmission line, for example, was the simplest and most straightforward course. Ideally, it was a straight line from point A to point B.

Money was the key factor. It cost less, in most cases, in equipment and man-hours to go straight ahead.

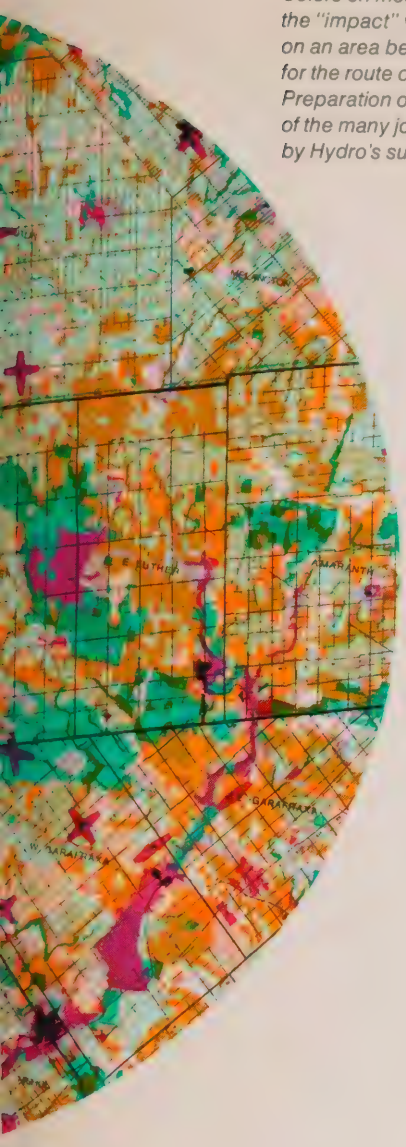
"Now", says Vern Backman, supervisor of location studies for the survey department, "monetary considerations are just one of our priorities. Other top considerations are environmental and legal."

Legalities, of course, involve the protection of people's rights within the law. Bu environmental factors aren't so well defined. They involve people's thoughts actions and reactions, which often can't set down clearly in words.

Mr. Backman explains that when faci ties for a proposed transmission line are being studied, people from many divisio are involved in examining seven distinct categories:

- Natural systems, such as waterways;
- Natural resources;
- Agricultural uses;
- Existing land uses;
- Future possible land uses;
- Visual impact;
- Linear restrictions, such as railway lin airports, communications towers and existing transmission lines.

When the general area to be studied determined, first consideration is given



Colors on mosaic map indicate the "impact" various factors have on an area being considered for the route of a transmission line. Preparation of such maps is just one of the many jobs carried out by Hydro's survey department.

obtaining suitable aerial photography. This is done by private contractors who have highly-qualified specialists do the work. It's more economical than for Hydro to maintain its own aerial flying services on a full-time basis. Weather and other seasonal conditions create peaks and valleys in the work load.

Contractors have their own aircraft, and usually use small twin-engined planes, such as Piper Apaches and Comanches, although for occasional high altitude flights, planes like Lear jets are used.

The flight altitudes can range from approximately 2,400 feet, for large scale photography, to about 30,000 feet, for small scale work.

For the all-important environmental studies and associated photogrammetric mapping, flights are made at 12,000 and 1,800 feet to obtain scales of one inch to 2,000 feet and one inch to 800 feet.

A flight plan is then laid out for the study area, to indicate to the contractors what flight lines should be followed to ensure that there is a 60 per cent overlap of exposures along the flight path, and a 30 per cent overlap between each flight line. Through this approach, complete stereoscopic (three-dimensional) cover is achieved.

The contact prints taken from the aerial film are nine inches by nine inches. Taken at a height of 12,000 feet, the width of coverage of a single photograph is 18,000 feet, or more than three miles. From 4,800 feet, the coverage is 7,200 feet, or more than one and one-third miles. The scale works out at 2,000 feet to the inch and 800 feet to the inch respectively. The number of exposures needed to cover a study area depends on the flight line length and the number of flight lines.

From this start, the whole picture of the area will be formulated into one huge overview.

Back in the survey department's offices, mappers assemble the photographs, using the 60 and 30 per cent overlaps to create a reasonably accurate concept of the area.

To establish control for the three-dimensional photographic image, control points which can be identified at ground level are chosen and marked on the photos. Horizontal controls – which show distances between objects – are selected from such points as telephone poles, fence corners, dead trees and signposts. Vertical controls – which indicate elevations – are noted at road intersections, railway crossings and on water, where water levels are known.

After the control points have been selected, the district survey office sends a ground surveying party into the field with the marked photographs to establish the vertical and horizontal ground measurements of the photo-identified controls. Without the input provided by the field surveyors, it would be impossible to achieve the ultimate accuracy required in the maps prepared by the survey department.

When the control photographs are returned from the field to the survey department, manuscripts are prepared from the acquired data. These are transparent plastic sheets which have control points plotted on them at the desired mapping scale of one inch to 200 feet.

With the aerial photographs and manuscript, a photogrammetrist, using an instrument called a stereoplotter, draws a map showing all physical features by means of lines – features such as roads, buildings, bush outline and the like. By contour lines, the vertical relief of the area is indicated. This is known as "conventional mapping."

The latest development in aerial surveying is orthophotomapping. The end result of this technique is an aerial photographic image scaled with the same accuracy as conventional mapping ("ortho" comes from the Greek work orthos, meaning "straight"). By combining all known surveying data on an area with related photos, and using a $75,000 machine, orthophotomaps are produced.

The advantage of orthophotomapping lies in three areas – its accuracy, its completeness and its speed. An orthophotomap can be produced at least three times as fast as a conventional map, and contains all visible evidence that exists in the original air negative. As Mr. Clements notes, "it takes no more time to produce an orthophotomap of an urban subdivision than it does to do one of a desert."

Hydro's orthophotomapping instrument, as the machine is called, was the second of its type in North America. There are now five in Canada and 10 in the United States produced by the same manufacturer. Hydro's use of orthophotography has been so successful that several other North American users have visited the survey department to see its application by the utility.

Producing an orthophoto or an orthophotomap first involves placing two consecutive plates of the aerial photography in the plotting machine. Then a photogrammetrist views them through a viewfinder which gives him a 3-D image. He also sees a tiny pinpoint of light which he can adjust manually so that it appears to be touching

Comparison of detail is shown in juxtaposition of an orthophotomap with a conventional line map. Contour lines appear white on the orthophotomap and black on the conventional map.



the ground. By a series of manipulations, the photogrammetrist adjusts the machine so that it corrects the image to remove distortion and produces true horizontal and vertical scale. Then a negative is exposed in the machine: a corrected, accurate, scalable medium which is as accurate as any map can be.

After the plates are scanned, another section of the machine can draw a contour map of the area.

As an end result, the new, corrected photograph can be overprinted with the contour map, producing an orthophotomap, the most sophisticated of aerial views.

Not all aerial surveying ends up in this form.

For most initial study purposes, mosaics are sufficient. Mosaics, as the word implies, are a series of aerial photographs put together into one large photomap, and come in three categories: uncontrolled, semi-controlled, and controlled.

Uncontrolled mosaics are produced by matching up similar detail on adjacent photographs. It's a fast method of assembling a photomap, although this method provides a relatively low scale of accuracy.

Semi-controlled mosaics are assembled generally using a 1:50,000 scale map to control detail and the alignment of main features such as roads, rivers, streams, lakes, ridges and gulleys, and are as accurate as a scale can be determined from the 1:50,000 map series. Because of the increased degree of accuracy, more time is needed to prepare a semi-controlled mosaic.

Controlled mosaics are assembled after the photo image has been rectified to known ground distances as determined by field survey measurements. They are accurate when scaled between points of known ground distances, but are seldom used because of the time and cost involved in preparation.

Mosaics are used in all preliminary aerial surveying, which covers much larger areas than those in final route selections – that's when orthophotomaps come into the picture.

Mosaics are also valuable educational

devices for both Hydro personnel and the public. A prime example is in route selection, in which environmental studies play such a large role.

The impact of any Hydro developments on the seven categories involved in environmental studies can easily be shown through the use of mosaics.

In maps prepared from mosaics, impact is shown by color: red for high impact, green for medium, yellow for low, and white for no discernible impact.

For example, in examining agricultural activities, Hydro personnel conduct a study of each farm shown on an aerial photograph of the area under investigation. The farms are rated on a 1 to 4 scale according to the actual use to which the farm and its facilities are put. A farm with extensive fields and a lot of equipment which has large crops or many animals or both would receive a rating of 1. On the other hand, a farm with dilapidated buildings and small fields which have gone to pasture would be graded at 4.

Other criteria – one of which is soil quality – are studied in the agricultural category to establish the over-all various levels of impact over the area.

As each farm is rated, an appropriate figure is noted on the mosaic, and when the map indicating agricultural impact is prepared from the mosaic, the numbers are translated into colors, and a pattern emerges.

Similar extensive studies are made by Hydro staff for the other facets of environmental concern and color-coded on the maps.

The maps are used as a base for transparent overlays. Not only does a pattern of color emerge for each of the categories of concern, but an over-all pattern can be seen when the overlays are put together.

With this procedure, recommendations can be made for suitable transmission line routes. Corridors of white and yellow areas appear, running between blocks of red and green. The latter are set aside as "no go" regions. High or medium impact areas are avoided if at all possible.

The mosaic maps and overlays are displayed at public participation meetings, so that the people who live in the area where a transmission line, or station, is required can see for themselves where the best routes – those with minimal impact – lie.

The maps are useful in drawing out comments from residents. At the meetings they are encouraged to voice their opinion. One way this is done is by placing numbers in circles on the mosaics and identical numbers of a flip board or other appropriate writing surface next to the maps. Citizens can put their comments in writing next to the number when they have a particular concern about a specific section of the area being studied.

Mosaics are used for other purposes, too.

They help uncover the earth's secrets.

Aerial photos reveal many things: glacial landforms and the nature of tree growth, for example. Discovering what sort of land lies in a certain area help Hydro's engineers to determine what kind of problems might be encountered in placing towers or building stations. Finding out if trees in a forested area are mature or just young scrub bush is important – Hydro wants to avoid disturbing mature growth.

The survey department works in concert with other Hydro departments, such as forestry, in interpreting its findings.

Working with planners in one case, it was found that lower towers would be needed for a line near Toronto International Airport and thus a wider right-of-way had to be acquired. Reason: a glide path came across the line route.

Photogrammetry provides a service to the Property division, too. With the use of aerial pictures, land holdings can be determined, and Hydro's property agents are supplied with mosaics showing who owns what in a certain area, so that proper steps can be taken for land acquisition, once a route has been selected and approved.

A lot of ground has been covered by Hydro's photogrammetry section since it was formed.

Although the first survey flights took place in the '30s, aerial surveying really took wing in 1946 when techniques developed in reconnaissance during the Second World War were put to peace-time use.

Today, as Mr. Clements says, "aerial and ground surveys complement each other. We get the best of all systems – and save time and money doing so."

Up to this year, when 40 more contracts are scheduled for completion, 31,000 square miles of Ontario have been photographed from the air for Hydro. Most of it has been in southern Ontario, where most of Hydro's lines and stations are: the southwestern area from Toronto to Windsor and up to Georgian Bay has been almost completely blanketed, as has been the eastern triangle between Ottawa, Kingston and Cornwall.

Over the years, mosaics have been prepared covering 21,000 square miles – more than 90 per cent of which are in the south. Last year alone, 13,000 square miles were photographed and 6,200 mosaiced.

To achieve this, aerial photographers have flown 14,000 miles – 5,600 last year.

Their endeavors are not one-shot efforts. For future use, 110,000 aerial photos are stored for ready access; 24,000 were taken as recently as last year.

These thousands of photographs tell the story of where Hydro has been – and is going. They show rights-of-way and line locations and are helpful for tower design and in appraising property.

And perhaps the most off-beat purpose aerial photography is put to is in helping keep inventory – coal inventory.

For among the many pieces of equipment in the survey department is a little object called a planimeter. Given the height of a pile of coal, and knowing the height from which a photo was taken, you can place this gadget on the picture of a pile of coal, draw its point around the sprawling outline of the heap, and tell the volume of coal there is at that location.

The one thing it won't tell you is what the price of coal will be next year. Except that it's an educated guess it will be up in the sky – along with Hydro's surveyors. □

CNA conference

$7 billion challenge faces nuclear industry

Delegates attending the 1975 annual conference of the Canadian Nuclear Association heard the CNA's future described in glowing terms – but were also warned of the challenges to the industry brought about by growing inflation and public attitudes.

Also highlighted at the session, held in Ottawa, were export policies, nuclear safeguards, the opportunities which exist for companies willing to get into the industry, and environmental considerations – with the emphasis on keeping the public aware of what is being done in this area.

J. P. Reny, director of the machinery branch of the federal department of Industry, Trade and Commerce, predicted that more than 40 nuclear reactors and associated facilities worth more than $7 billion will be built in Canada within the next 10 years.

He said such an expenditure, estimated at $700 million a year, presents a major challenge to the Canadian nuclear industry. The amount is twice as much as that spent now in annual production of conventional power plant equipment and corresponds to approximately 20 per cent of the annual Canadian production of all industrial machinery.

Mr. Reny said Canadian manufacturers must handle exotic and difficult materials and must exercise a level of quality control which in some instances is on a par with, and may even exceed, that required in the aerospace industry.

Mr. Reny said the upcoming demand for reactors will be about four times what has been required in the past.

"Canadian industry recently has supplied the equivalent of about one reactor per year. It is now facing a demand of about four reactors a year and in some years may be called upon to supply up to six. With present facilities we estimate th the industry can supply between two and three reactors a year."

Mr. Reny said much of the nuclear bu ness would be handled by major supplie who in turn would farm it out to smaller companies. He identified 60 suppliers bu said that eventually the economic benefi of the nuclear industry could be spread t more than a thousand companies.

"When I say that the nuclear business important I am not just referring to its ob ous importance in terms of meeting the future energy needs of the country, but also to its importance to the manufacturi industry.

"How often have we heard it said that the Canadian industry would not have ar real problems if only it had a large enou market. Here we have a big enough domestic demand to sustain, by itself, a strong manufacturing sector in a high technology area. Candu is a new area of sophistication and high technology whic can raise the technological competence Canadian industry to unprecedented lev els. If this technology is widely disseminated throughout industry through optimum participation in the nuclear cor struction program, it will provide added benefits in terms of international compe tiveness in both nuclear and other produ areas," he said.

J.D. Wilson, manager of supply plann and resources development for Ontario Hydro, told the conference that Hydro's proposed nuclear program will, in the ne several years, be translated into approxi mately 6,000 man-years of direct labor a 3,900 man-years of indirect labor annua The jobs involved are of a relatively high skill level requiring long periods of traini or education, he said.

"Industry cannot be expected to pro vide the people and facilities by operati in the dark. Ontario Hydro is willing to assist, if only by the dissemination of knowledge, in order to promote the logi

growth of industry in Canada to meet the needs of future power generation," he said.

Another speaker, L.P. Perry of Dominion Bridge Company Limited, discussed the current investigations into the development of 1,200-megawatt units to meet anticipated future needs in Canada. To supply such units Dominion Bridge is in the process of expanding its facilities in Quebec, he said.

"It appears that the continuity of orders is now upon us. The manufacturer can now, with a degree of assurance, proceed to build up his internal expertise, thereby increasing his own efficiencies and maintaining a reasonable control over his production cost."

renewed uranium exploration urged

There is a need for renewed uranium exploration activity in Canada, says retiring CNA president J.M. Douglas.

Mr. Douglas, who is also president of Babcock and Wilcox Canada Limited, discussed details of Canada's uranium policy in which first priority is to be given to the domestic consuming industry.

"New uranium mines are being developed in northern Saskatchewan by Gulf Minerals, and by AMOK, a subsidiary of French companies. Greater activity is planned in Ontario. Even so, more exploration and development work is required now in order to accommodate the needs of domestic and foreign utilities."

He said he hoped Canada's new uranium policy would clear the way for such activity.

Mr. Douglas added that Manitoba has decided to develop nuclear power after the hydro potential of the Nelson River has been fully harnessed. The first nuclear unit is expected to be on stream between 1985 and 1988.

He felt, though, that the supplies of low-cost coal in Saskatchewan, Alberta, and British Columbia would delay any nuclear activity there for some time to come.

In Nova Scotia, a nuclear power advisor has been appointed, and Ontario, Quebec and New Brunswick are all actively involved with nuclear power, he added.

With the growing emphasis on nuclear power, Mr. Douglas concurred with the call for more public education.

Steps must be taken now to head off misconceptions about nuclear power in order to safeguard nuclear energy's future role in electric power generation within Canada, he said.

He noted that nuclear generation has been placed in jeopardy elsewhere because positive, factual information has not been made available or has not been made available in a clearly understood form.

"Small but well organized environmental groups have used information which is incomplete – or inaccurate or misleading – to produce scare stories. These have too often been circulated with devastating effects. Too often, this information, in the absence of factual information supplied from an informed source, has influenced people who are fair-minded to become prejudiced against the use of nuclear power."

He said the CNA and the nuclear industry in Canada must greatly increase efforts to communicate factual information to those who seek it so that other, inaccurate information does not enter a vacuum which might otherwise exist.

The CNA must assist and perhaps help to co-ordinate in the most appropriate ways the communication efforts of utilities and governments so that optimum results may be obtained, he said.

'keep open mind on alternatives'

Federal Environment Minister Jeanne Sauvé warned Canada's nuclear industry that while nuclear technology may appear to be the principle source of electric energy in the future, history and common sense demand that other alternatives should be examined with an open mind.

"It is incumbent upon us to calculate the environmental effects of not developing nuclear energy as the major source; also to consider, just as objectively, the environmental effects of using other energy forms, old or futuristic. In making these evaluations, it is our duty to consider not simply the technological and economic pluses and minuses, but the social and environmental ones too."

Mme. Sauvé said that people in the Canadian nuclear industry had a unique responsibility.

She said Canada supports the view of the United Nations environment program that the problems and demands of nuclear energy are a matter of continuing environmental interest and concern, and not solely a matter for technical discussions within the International Atomic Energy Agency.

At home more time is required to resolving difficult questions . . ."Are we, for instance, keeping accurate books when we relate the costs of nuclear energy to its benefits? Are we including all the costs? In addition to the dollar cost of constructing a string of generating stations, are we considering the energy costs, the social costs?"

Mme. Sauvé said Canada is fortunate that it is not compelled by desperate need to forego such questioning.

"We do not need to gamble. We are lucky in that full-scale implementation of nuclear power has been delayed to a time in history at which we are able to see, up ahead, the possible dangers. There is still time to uncover some of the major remaining mysteries and to work on some of the unsolved problems before we cross the gap into the nuclear age."

The minister cautioned that the most threatening problem at the moment is the handling of radioactive wastes. She described present storage methods in Canada as a sophisticated holding operation until a better answer is found.

"In a sense, it is a sweeping of the problem under the rug. Even if it is a rather well-made rug. Clearly, we cannot evade confrontation with the problem indefinitely. Day by day the problem builds up throughout the world."

Mme. Sauvé said that it is imperative to delve carefully into all aspects of nuclear power and tell Canadians the complete truth.

"We should explain what we know about the benefits of nuclear power and we should, with equal candor, say what we know and suspect of the dangers. We should make the examination in public, showing why we believe the benefits outweigh the risks. We should say what we can of the unknown future cost of unknown potential threats from unknown factors – report whatever we can calculate of the probability of errors occurring and how serious they might be. We should open up the debate on uranium enrichment and the recycling of plutonium 239 or other radioactive material in reactor wastes, so that we may establish the risks as well as the benefits."

Mme. Sauvé urged the CNA to get involved in this process and to include the general public.

"We can no longer treat nuclear power as if it were a religious mystery to which only initiates could have access. Unless we decide to return to the simplicities of life in the early agricultural age, when ploughs were complex machines and horses were powerful energy sources, we shall never again live a life free of technological risk."

public attitudes play bigger role

Public attitude studies by Ontario Hydro indicate the existence of large blocks of uncommitted individuals on the subject of nuclear power.

So said John Davies, manager of Ontario Hydro's Public Attitude Research department.

Mr. Davies noted that public attitude surveys are playing an increasing role in Hydro's early planning activities.

In many cases, opponents of nuclear power projects have not provided the data indicating what portion of the population share their view. Yet their statements often stand as public condemnation of this means of energy production, with the implication of failure by the Canadian industry to act responsibly in terms of social values.

"Thus the concerns of society and public attitudes to nuclear power have become an important factor in planning for future nuclear generating capacity in Canada. While we have escaped the strong public reaction against nuclear power evidenced in the U.S., Japan, Norway, Sweden, France and Switzerland, Canadians since 1970 have been showing an increasingly active interest in nuclear matters. A number of new groups opposed to nuclear power developments have been formed and there have been attempts to form a federation of such groups across the country and regionally which suggests a new phase in the industry's relations with the public may be beginning," said Mr. Davies.

However, experience to date indicates there is insufficient classified social information which pinpoints public attitudes to the nuclear industry in Canada, he said.

"I say apparent because in the absence of data from representative samples of the population, the industry has been forced to make judgments about public attitudes based on the day-to-day interface of some of the public and industry."

This traditionally has taken the form of public debate, hearings and meetings, activities of interest groups, national me and the political interface, the speaker said.

In Ontario, Mr. Davies and his staff ha commenced more detailed studies.

He outlined public attitude studies in Ontario in Huron county and on the nort shore of Lake Huron in which random s ples of the population were interviewed Specific observations drawn from the st ies were that the proportion of the popu tion which is opposed to nuclear power appears to be quite small, and that there are large blocks of uncommitted individ als often ranging in size from one-quart to one-third of the populations. The deg of opposition appears to differ between men and women with the women less w informed and more opposed.

Mr. Davies said there are more than interest groups in Ontario and New Bru wick who are concerned in one form or another with nuclear power. They vary i structure, aims, objectives, communica tions patterns and effectiveness, but a g eral concern for the quality of life and lifestyles appears to underlie many of them.

While the majority of these groups a their infancy, their social impact can be significant, he said. Already there is so indication that shifts in public attitudes taking place. In some cases, for instanc they consist of the formation of negativ positions on the part of persons who w previously uncommitted.

Mr. Davies said the nuclear industry have to seek a new accommodation wi the public to avoid the appearance of being at odds with desirable social goa

nflation's effect on nuclear role

High rates of inflation could have an adverse effect on the costs of nuclear generation as opposed to fossil fuels, says a member of the CNA's economic development committee.

L.J. Schofield, manager of energy economics for Shell Canada Limited, said that if sustained high capital cost inflation rates continue and if coal costs escalate at a relatively low rate, the economic advantage of nuclear stations could be eroded and fossil-fired stations could again become the choice for base load generation.

Mr. Schofield said the major element of nuclear generation costs is the capital recovery charge which comprises about three-quarters of the total electricity cost. The nuclear station, therefore, is highly sensitive to project cost escalation rates.

The speaker noted that between 1950 and 1960, Canadian inflation, as measured by the gross national product price deflator the difference between the increase in the GNP and the increase in inflation – averaged 3 per cent a year but dropped to .5 per cent between 1960 and 1965. Subsequently it escalated to 4.3 per cent between 1965 and 1973. In 1974, it registered a 13 per cent increase and is expected to rise by 10 per cent this year.

Mr. Schofield said the GNP price deflator has not fully reflected the degree of capital cost inflation associated with major energy-related projects. "We have witnessed hyper-inflation in construction costs of new capital facilities in the recent past. The Syncrude tar sands project was re-estimated from less than $1 billion to $2 billion. Stelco's Nanticoke project escalated from $480 million to $710 million and the Petrosar project is estimated at $430 million, an increase from the original $250 million."

Mr. Schofield said that some sources had predicted future inflation rates will continue at about 6 or 7 per cent. That being the case, capital cost inflation rates for large construction projects will likely continue into double figures.

Added to this are mounting interest rates which are currently running around 10 per cent.

"While these rates are high, they have still failed to match the 13 per cent price inflation experienced in 1974. Nevertheless, investors cannot be expected to offer money at rates less than the general inflation rate of the economy in the long run, so that again a higher inflation rate than that of the GNP price deflator may have to be considered for the cost of capital."

Mr. Schofield said a 12 per cent compound growth rate would triple costs over a 10-year period. As an example he compared a 3,000-megawatt coal-fired station with a nuclear plant of the same size. The coal-fired station is expected to cost $755 per kilowatt in 1982 and climb to $2,345 per kilowatt 10 years later. The equivalent nuclear station cost would be $1,523 a kilowatt in 1982 and $4,729 10 years later.

The speaker said fuel costs for coal plants are in the order of three to seven times higher than for nuclear plants. He said with coal costs escalating at an annual rate of 8 per cent, there is a distinct nuclear advantage. The uniform cost is 36 per cent lower but if coal prices escalate at 5 per cent there is no nuclear advantage except that for the first eight years of operation, coal-fired plants would produce cheaper electricity than nuclear stations.

"There is a significant advantage for nuclear generating costs at coal price escalation of 8 per cent or above, which would be offset only by sustained capital cost escalation rates in excess of 13 per cent per annum, but at low coal escalation rates of 5 per cent, the competitive advantage for Candu stations is small and could be completely offset by double digit inflation of capital costs," he said.

Mr. Schofield said the problem creates a real challenge for the nuclear industry in Canada. He said technological improvements both through original innovation and as a result of the learning curve, financial flexibility, economies of scale, reductions in construction time and costs, and efficiency in fuel preparation must all be diligently pursued to offset the effects of inflation.

a bundle of joy for the PM



Prime Minister Pierre Trudeau laughed when CNA president J.M. Douglas presented him with the actual 100,000th fuel bundle produced in Canada by the nuclear fuel industry.

It was a bundle of joy for the nuclear industry because it was symbolic of the efforts that have led to Canada's nuclear program being considered one of the best in the world.

The particular bundle presented to the prime minister was the product of teamwork by several companies: Rio Algom and

Eldorado supplied the uranium, processing was by Eldorado Nuclear and the manufacturers were Canadian General Electric and Westinghouse Canada Limited.

Mr. Douglas noted that the bundle weighed 23.7 kilograms (52.14 pounds) and the fuel assembly would produce thermal energy equivalent to that produced by 450 tons of coal or 2,050 barrels of oil.

After making the presentation the CNA president immediately took back the bundle, noting that the emphasis on energy conservation dictated that it be used at Pickering for its intended purpose. However a dummy bundle was presented to the prime minister for display in his office.

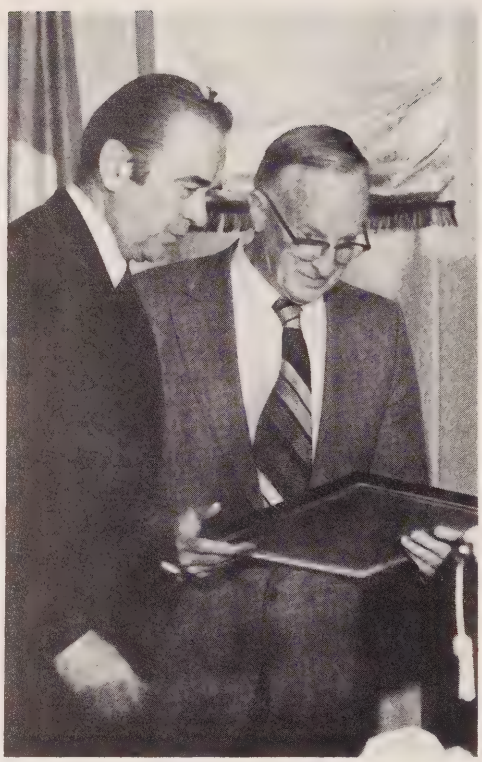
"When you were making the presentation I was trying to decide what to do with it," Mr. Trudeau said.

"I could not use it in my office because there's enough heat generated there already. The only other use I could think of was to heat my new swimming pool."

Mr. Trudeau discussed Canada's nuclear policies, including exports, safeguards and programs to foster the industry in Canada.

He emphasized the government's obligation to help the Canadian nuclear industry along, especially at a time when shortages of fossil fuels and other energy sources are creating problems around the world.

The prime minister noted that the federal government maintains a policy of assistance in financing the first nuclear units in each province. He paid tribute to the nuclear pioneers in Canada and noted that Hydro's Pickering station is an example of what can be done. Pickering, he said, would help to stimulate exports to other countries.



medal for a pioneer

Dr. G.C. Laurence, retired president of the Atomic Energy Control Board and one of Canada's nuclear pioneers, has been named the second winner of the Dr. W.B. Lewis Award given by the Canadian Nuclear Association.

The first winner was Harold Smith, Ontario Hydro's vice-president of engineering and operations.

The medal and the engraved certificate were presented to him at the CNA conference in Ottawa.

Established in 1973, the award honors Dr. W.B. Lewis, senior vice-president of science of Atomic Energy of Canada Limited until his retirement in 1973.

Dagenais takes over

Camile A. Dagenais was named preside of the Canadian Nuclear Association at annual conference. Mr. Dagenais is cha man of the board and chief executive o cer of the SNC Group, a Montreal-base organization operating in the field of pr ject management, engineering, procure ment and construction. He feels that security and control of Canada's nuclea power are priority objectives and that a major task will be informing the public clearly and honestly about the facts cor cerning nuclear power. □

OMEA district 5



S. A. Baldwin, president of District 5, left, discusses the program for its spring meeting with provincial president A. B. Cousins, centre, and Andrew Frame, a senior advisor to the Ministry of Energy.

Cousins stresses importance of local studies

Municipal utilities within areas served by restructured local governments have been urged to keep local study teams concerned with the restructuring of local utilities advised of their desires under a regional setup.

Ontario Municipal Electric Association president A.B. Cousins told a spring meeting of the OMEA's District 5 at Port Dover that "the importance of the local study team cannot be over-emphasized.

"It's the local study team that must deal with the specifics as they relate to the areas within the given region under study. It's to this group that everyone in the region will be able to make their views known.

"It (the local study group) is a crucial level for input. Local study teams will likely be made up of a minimum of five or a maximum of 11 members and will provide equal representation for councils and commissions. Where large rural areas exist they will require representation and that will likely be provided by councillors," Mr. Cousins said.

He added that the enormity of the problem has required that the steering committee on the restructuring of municipal utilities establish a system of priorities.

"It recommended that all utilities in areas where restructured local governments are operative take steps to urge restructuring studies by writing to the steering committee," Mr. Cousins said.

Dealing with Ontario Hydro's application before the Ontario Energy Board for a rate increase, Mr. Cousins said the OMEA's position will be one of inquiry.

"It will be our position to seek to have Ontario Hydro justify its statements, assumptions and contentions or alter its position.

"In particular," he added, "we'll be looking at any reallocation of costs to make absolutely certain that any proposed shifts in cost allocations do not work unfairly on the municipalities or their customers."

Frame urges municipal utilities to support Hydro

senior advisor to the Ministry of Energy has appealed to municipal utilities to provide greater support to Ontario Hydro.

Andrew Frame, senior advisor – utilities with the ministry, and a former member of the Hydro board and 1971 president of the Ontario Municipal Electric Association, told the OMEA's District 5 that Hydro is "being beaten and battered from a lot of sides and is high time the provincial utility had some friends.

"Protest groups," Mr. Frame said, "are loud and well-organized. They write letters to the ministry. One told the minister that if he didn't get up off his butt and cut down on Hydro's spending they'd get someone in there who would.

"Hydro", Mr. Frame added, "needs some friends. There are 2 million-plus people in this province who don't write letters. In the last year or two Hydro has suffered from a lack of support. There's no Hydro pressure group and the time has come for some responsible voices to be heard from the communities of this province in support of Hydro."

Mr. Frame pointed out that Hydro's system will have to double in the next 10 years – possibly seven – because no one knows what's going to happen to oil and gas prices over that time span. And he added that Ontario Hydro is known as one of the leading technological groups in the world – another reason for municipal utilities to come out in strong support of it.

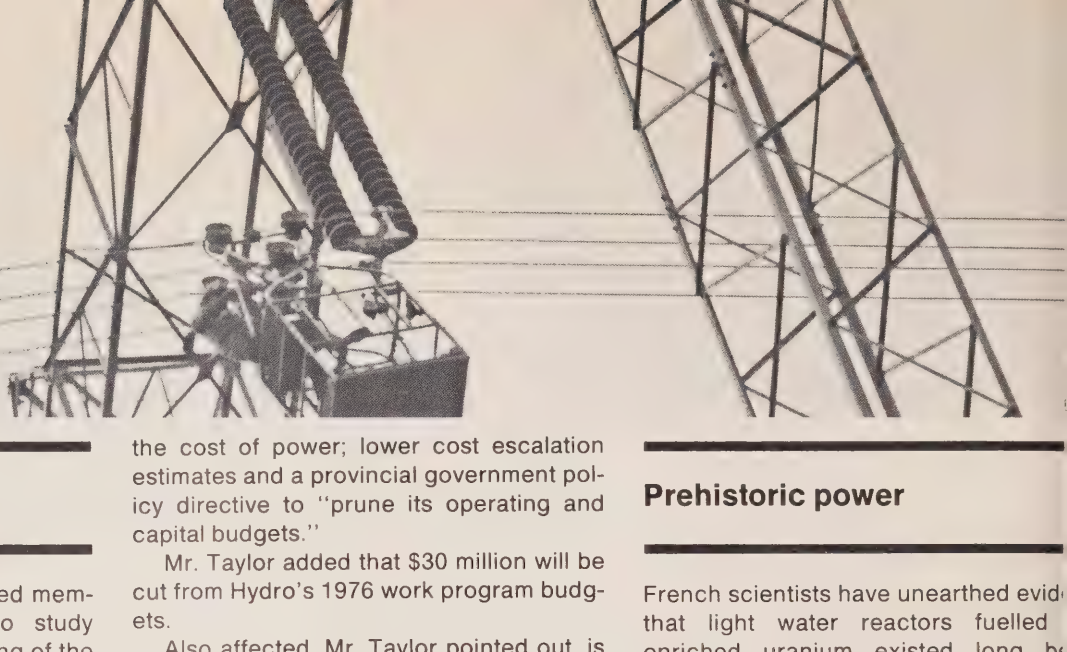
He described the Ministry of Energy as a "policy ministry – not a delivery ministry."

Mr. Frame said it's the smallest ministry in the government with the smallest budget. However, it has the greatest impact on the province, he said.

Its function, Mr. Frame said, is to review energy matters and advise the minister on energy policy, "and the intention is for the ministry to remain a policy one."

One of the planks in the ministry's platform is to form an energy policy for the province which will enable Ontario to become self-sufficient in meeting the province's energy needs, Mr. Frame said. □

along hydro lines



Hydro probe group

The Ontario government has named members of a royal commission to study Ontario Hydro's long-range planning of the province's power requirements.

Resources Development Secretary Allan Grossman says the royal commission will be called the Royal Commission On Electric Power Planning.

Dr. Arthur Porter, a University of Toronto professor of industrial engineering and chairman of the Canadian Environmental Advisory Council, has been named chairman.

Other members include Robert Costello, vice-president of operations for the Abitibi Paper Co. Ltd., Solange Plourde-Gagnon, a former Queen's Park correspondent for the Ottawa newspaper Le Droit, George McCague, a Harriston farmer and executive of the Ontario Federation of Agriculture, and William Stevenson, an economist and member of the Ontario Energy Board.

Rate proposal cut

Ontario Hydro has reduced its 1976 wholesale rate increase proposals to 25.1 per cent for municipal utilities and 24.9 per cent for direct industrial customers.

Chairman Robert Taylor told the Ontario Energy Board that to the average residential customer served by a municipal utility, the revised increase will mean an additional $2.50 on a monthly bill, in contrast to the originally proposed $3.

Hydro had said in April that increases of 29.7 and 29.9 per cent for the municipal and industrial customers would be needed in 1976.

Mr. Taylor told the Energy Board that the change in Hydro's proposals comes as a result of several new factors – deferring collection of deficits accumulated by municipal and industrial customers; reducing the system expansion component in the cost of power; lower cost escalation estimates and a provincial government policy directive to "prune its operating and capital budgets."

Mr. Taylor added that $30 million will be cut from Hydro's 1976 work program budgets.

Also affected, Mr. Taylor pointed out, is the construction of generating stations to meet future power needs. The program of in-service dates is deferred six months starting with the second 3,200-MW nuclear station at the Bruce nuclear power complex, resulting in a reduction in capital requirements to 1985 of about $1.2 billion.

"This represents a substantial reduction in our rate proposals," Mr. Taylor said.

He added that "it means that Ontario Hydro is foregoing half its system expansion charge and is deferring the collection of deficits to future years.

"It (deferments) pushes those key ratios, toward which lenders look for financial credibility, dangerously close to the limits beyond which the Hydro board considers it imprudent to go. The financial strength of the organization is being eroded at the very time that increased demands will have to be made on capital markets," Mr. Taylor said.

Regional manager

Gordon E. Patterson has been named manager of Ontario Hydro's Northwestern region.

He succeeds K.N. Bodkin, who has retired after 42 years' service.

Mr. Patterson received his early education in Medicine Hat, Alberta, and was graduated as an electrical engineer from the University of Manitoba in 1949.

Most of Mr. Patterson's Hydro career has been spent in customer service work in the Georgian Bay and Northeastern regions. He has been Northeastern region marketing manager since 1972.

He is second vice-president of the Association of Professional Engineers of Ontario.

Prehistoric power

French scientists have unearthed evid that light water reactors fuelled enriched uranium existed long b Noah built his ark.

If the scientists are right, two or t fission reactors operated in what is the African republic of Gabon about 1. lion years ago.

These reactors, assembled natural geological processes, produced se kilowatts more or less continuously f least 100,000 years and possibly for than a million.

According to Scientific American existence of the natural reactors was revealed three years ago at the Fr gaseous diffusion plant at Pierrelatte a laboratory preparation of uranium h luoride gas showed a slight deficit i expected content of uranium-235.

Workers tracking down the discrep found that more than 700 tons of ura shipped from a mine north of Okl Gabon, was depleted in U-235. The plausible hypothesis was that some U-235 had been consumed as fuel in ural uranium reaction at the site o mine.

Two things were essential for su phenomenon to have occurred: a suff enrichment of U-235 above the n value and a moderator, such as wat slow down the fast neutrons releas spontaneous fission to support a reaction.

"Since U-235 spontaneously di grates with a half-life of .7 billion years can calculate that 1.7 billion years ag Gabon deposits contained about 3 pe U-235, or about the level of enrich found in the fuel of commercial nu reactors," Scientific American reports

"There is also geological evidenc the uranium, in the form of its oxide well mixed with a variety of hydrated r als, so that the reaction centres cont about 15 per cent water, at least som in liquid form, saturating the mineral b

"The ratio of water to uranium oxide was about the same as it is in a typical man-made light-water reactor."

Finally, the article states, the reaction centres had to be reasonably free of any well-known nuclear reaction "poisons" such as boron, which have a voracious appetite for neutrons and would have made a chain reaction impossible.

A full description of the fossil reactors appears in Bulletin d'Informations Scientifiques et Techniques, published by the French Atomic Energy Commission.

Water heater

Waste hot water from a power generating station has been used with some success in an experimental greenhouse at Lake Wabanum, 40 miles west of Edmonton.

R.M. Trimmer, Alberta's provincial horticulturalist and the project supervisor, says the 2,400-square-foot greenhouse is one of the first in Canada to salvage waste energy for agricultural purposes.

He says the greenhouse, which opened a year ago using water from the generating station as its only heat source, produced excellent produce in summer and trees and shrubs in winter."

But initial findings indicated mid-winter growth of vegetables might not be possible.

The hot water from the plant runs through an intricate web-type framework with fans blowing the warmed air over the produce.

Mr. Trimmer says the air temperature inside the structure is only 10 or 15 degrees cooler than the water even when the mercury outside dips below zero.

The system has the opposite effect in summer — cooling the air in the domed, glass-fibre building.

Mr. Trimmer says the first year's experiments showed a much longer summer growing season can be achieved under real conditions — but that the temperature was not high enough for good results in winter vegetable growth.

Candu – U.S. style?

Canada has been asked to take part in a study that could result in Canadian-designed nuclear reactors – Candus – being built in the U.S.

The request came from Nelson Sievring, assistant administrator for international affairs of the U.S. Energy Research and Development Administration.

In a letter to Atomic Energy of Canada Limited president John Foster, Mr. Sievring asked AECL to co-operate in a joint study on the problems involved in introducing Canadian technology in the U.S.

With the U.S. showing interest in Candu, Canadian nuclear technology should achieve a real boost in prestige since Canadian development has been overshadowed by U.S. expertise for many years.

The Candu reactor uses natural uranium as its fuel and heavy water as its moderator while the U.S. model uses enriched uranium as a fuel and light water as a coolant.

Another important difference is the Candu model can be refuelled while still operating while the U.S. plants must be shut down.

Grants doubled

Ontario Hydro is doubling its annual grants to the municipalities, county, and school boards serving the Bruce nuclear power development to compensate for any adverse financial impact resulting from the project.

Announcement of the increased grants was made to Bruce area municipal officials by Energy Minister Dennis Timbrell and Hydro chairman Robert B. Taylor.

Under a new formula for setting the grants, they will total about $500,000 annually.

In effect, the new formula attempts to set up an improved system of helping affected communities pay for the educational and municipal services required by the influx of a large number of people associated with the project.

In making the announcement, Mr. Taylor said Hydro has no intention of allowing any community to suffer as a result of the presence of one of its facilities.

And he added that the formula might be revised in later years and said Hydro is leaving the door open.

The grant program calls for a total payment to be calculated as if the Hydro facilities were located in a single large community, rather than in Bruce township alone.

After payment of the required grant in lieu of taxes to the township, the remaining amount will be distributed in proportion to the number of employee households in each municipality.

For purposes of calculation, Hydro facilities in Bruce will be counted from the beginning of construction rather than from in-service dates since much of the impact takes place during the construction phase.

Restructuring post

Ontario Hydro's D.A. Ramsay, recently appointed executive director of the steering committee for the restructuring of local utilities, will devote full time to the position.

Until late June Mr. Ramsay held the dual post of executive director of the steering committee and project director of Hydro's task force on electricity costing, pricing, impact and demand elasticity.

However, because of the increasing workload in connection with the restructuring group, Mr. Ramsay could no longer continue in the dual role. He has been succeeded on the electricity task group by G.O. Davidson, co-ordinator of the study team's pricing section.

Restructuring steering committee chairman S.A. Baldwin, of Ancaster, has named J.A. Young, Waterloo region chairman,

Herbert Epp, Waterloo mayor, R.J. Kerr, Cambridge mayor, Howard Ziegler, Woolwich mayor, Donald Weber, Kitchener PUC chairman, W.A. Smith, Waterloo Hydro vice-chairman, J.A. Warnock, Galt PUC chairman, and Ray Behrendt, Bridgeport Hydro chairman, as the first local study team. It will conduct feasibility studies and analysis of possible alternatives for restructuring utilities within the regional municipality of Waterloo. Others were to be announced shortly.

Mine standards

The Atomic Energy Control Board is establishing its own federal radiological protection and health safety standards for workers in uranium mines.

AECB president Allan Prince says the new standards, expected in the near future, are being established by a special AECB mine safety advisory committee. They will replace existing provincial standards.

For new mining operations, the standards will be incorporated into the licensing requirements.

For the four existing uranium mining operations, the new standards will be added to the requirements under the existing AECB licences within two months, Dr. Prince says.

The new standards will likely set a maximum annual exposure to radon gases of four working level months for individual workers. This is about 0.36 working level, close to the previous federal recommendation of 0.3 working level.

"If individual workers reach a point when they would be overexposed, then we would have to insist that they not be subject to any additional exposure for the rest of the year," Dr. Prince says.

Alternatives for the companies are to reduce the radon gas exposure levels in all parts of their mines so that no workers face overexposure, or to shift workers around in the mines so they are not overexposed.

Dr. Prince adds that the AECB has not decided whether to become actively involved in setting health safety standards in uranium mines by way of licensing requirements, or leave that responsibility with the provinces affected.

Safety record

Ontario Hydro has established the best construction safety record in the province.

The low disabling injury frequency rate of 14 per million manhours worked for 1974 is less than half that of the rest of the construction industry in Ontario.

Fred Green, Hydro's safety department manager credits a concerted safety-consciousness program with bringing the record down from a high of 40 in each of the years 1956, 1957 and 1958.

"Although construction staff has nearly doubled from the late '50s the accident frequency has decreased steadily," Mr. Green says.

In the meantime, employees at Lambton generating station, near Sarnia, have made the station the first Hydro thermal plant to clock a million hours of work without a lost-time accident.

Station manager Basil Gill also says the number of minor on-site injuries – involving no loss of time – during January to June dropped almost 50 per cent from the same period last year.

Potential windfall

The Ontario government is to look into the feasibility of using windmills to provide electricity for remote northern communities and to power telecommunications systems.

The Ministry of Energy and Ontario Hydro have advertised for consultants' proposals on the application of wind generators for local power supply.

"Wind energy offers the potential for energy production on a local scale v minimal environmental impact and freec from the price escalation of fossil fue says Energy Minister Dennis Timbrell.

However, provincial energy officials do not believe that wind generation ever have a major impact on the suppl energy needs. But the high costs transportation and access difficu encountered in providing electrical ser in far northern areas could make windr attractive.

A demonstration project may be un taken by the province next year if the st warrants a field test, Mr. Timbrell says.

The proposals will be reviewed b selection committee of representative Ontario Hydro, the ministry, the Nati Research Council and the federal Atn pheric Environment Service.

Meanwhile, the Quebec governmer preparing to build a $200,000 experime windmill on the Madeleine Islands to nish supplementary energy to the islanc

A Hydro-Quebec spokesman says utility hopes to save money on fuel on bines now in use to supply electric en to the islands.

R.J. Templin of the National Resea Council has indicated the Madeleines constantly subjected to a wind of 15 m an hour or more. This velocity is suffic to operate a windmill capable of suppl an "appreciable amount" of energy.

D_2O for Christmas

An Atomic Energy of Canada Lim spokesman says he expects the Glace Nova Scotia, heavy water plant to be p ucing its own heavy water, from start tc ish, by Christmas.

The plant, plagued by opera difficulties since it was built, has recy low grade deuterium oxide from the Bi heavy water plant at Douglas P Ontario, to produce the first reactor g heavy water at this 12-year-old site.

The Ontario water was refined to 2C cent deuterium at Bruce by the dual te

erature exchange process first used commercially at Point Tupper almost five years ago.

AECL ran the low-grade water through the Glace Bay plant to make sure that the local distillation unit, consisting of two 170-foot towers, is ready for operation.

However, before producing its own heavy water, the plant will have to complete work on its enriching units where the initial deuterium concentration is achieved.

Fusion power probe

A joint university-industry-government study group has recommended that Canada launch a six-year, $72 million coordinated fusion research effort to prepare the nation industrially to take advantage of the hoped-for harnessing of energy processes that power the sun.

The project should be fully funded and managed by the federal government, using contracts with universities and industry for research and development, the group says.

Envisaged in the report are the construction of a $6 million magnetic-confinement tokamak machine – a controlled thermonuclear fusion device developed in the Soviet Union – and $6.5 million worth of laser-triggered fusion devices for studying the feasibility of controlling fusion to produce energy, and an $8 million high energy neutron source for studying and developing the types of materials that would be needed in a fusion reactor.

Such a program would give Canada the scientific knowhow, the engineering awareness and technological capability to take advantage of fusion as a future energy source in the event controlled fusion is shown to be technologically and economically feasible.

The report, supported by the Science ministry, the Defence Research Board and the Atomic Energy Control Board, was prepared by scientists from the Hydro-Quebec research Institute, RCA Research Ltd., the Defence Research Board establishment at Valcartier, Quebec, the University of Quebec and the University of Montreal.

"Controlled fusion offers the potential of providing a new, important source of energy for an energy-hungry country like Canada," the scientists conclude.

Energy scheme

Dutch scientists are working on a giant scheme to generate what they term "clean" energy by harnessing the fierce winds of the North Sea.

The plans envisage a long chain of wind turbines, like colossal windmills, stretching along the coast or on artificial islands out at sea.

The scheme would please Dutch environmentalists who fiercely oppose building more nuclear power plants because of what they claim is a risk of pollution and damage to wildlife.

The government's industrial council for oceanology, one of the groups studying alternative sources of energy, says a power station with 150 wind-driven turbines could produce as much electricity as the 450-MW nuclear power station near Flushing in south Holland.

"Technically, it would be possible to start the project within six years. Right now we're evaluating the cost aspects," says Prof. Willem van Gool, chairman of the government steering committee on energy.

Experts estimate that generating electric energy by wind turbines would probably cost about 50 per cent more than by conventional means because of the new technology required.

But the scientists hope that large-scale production would cut costs substantially.

The marine power station would probably consist of about 50 units, each with three wind turbines built on giant steel towers 325 feet high. The units would be driven by three huge rotor blades about 164 feet long.

The units, constructed on platforms similar to oil rigs, would be placed about half-a-mile apart.

The scientists believe that the output of wind turbines at sea would be considerably greater than along the coast or inland where the wind would be less strong.

Only 50 turbines, they say, would be needed out at sea to generate 500 MW, but the same output along the coast would take 85 and 125 inland.

To master the problem of uncertain wind conditions the so-called seamills might be linked with conventional power stations supplying the main grid.

Nuclear popularity

High oil prices have prompted nuclear power projects in many nations, says the Wall Street Journal.

In the past year, 30 nations – not including the U.S. – have increased their commitments to nuclear power, a survey of a U.S. trade organization shows. The number of reactors operating, under construction, on order, or planned in the 38 countries rose to 426 from 348 a year earlier.

The U.S., by comparison, has 55 reactors working, 63 under construction, 101 on order and 16 planned, for a total of 235.

In its annual international reactor survey, the Atomic Industrial Forum, the trade group of the U.S. nuclear industry, reports that the spurt of orders for nuclear power plants abroad in just one year is mostly attributable to economic and political pressures caused by the Middle East oil situation.

The survey also found that U.S. nuclear technology continues to dominate in new foreign plants. In the 38 nations surveyed, so-called light water reactors, a U.S. development, account for 70 per cent of the plants.

This year, Switzerland is producing 17 per cent of its electric energy with nuclear power, the highest figure for any nation. The U.S. has the capacity to generate nearly 8 per cent of its electricity with nuclear plants. After Switzerland comes Belgium with 15 per cent and the U.K. with 10 per cent.

In terms of total commitments to nuclear power, including plants planned, France, Spain and West Germany lead the world outside the U.S. By the end of the century, some of the 38 nations surveyed expect to produce as much as 85 per cent of their electricity with nuclear power. By then the U.S. should be generating about 50 per cent.

Farm gas

Petroleum products are necessary in the production of food, and to ensure an adequate supply for the farmers, a price increase in gasoline and diesel fuel to non-agricultural users should be considered, says R.G. Winfield, a former Ontario Hydro farm sales officer, turned farmer.

Speaking at the 27th annual Hydro-sponsored farm day, Mr. Winfield said: "While a price increase may not be politically expedient at this time, food production is certainly an essential use of portable petroleum products. There's only one more essential use – aviation."

Mr. Winfield said that in Ontario 6 per cent of the gasoline and 8 per cent of the diesel fuel is sold to farm customers.

"The actual amount of petroleum products used in food production totals about 100 million gallons a year. That amount of heating oil would be used in 100,000 homes, or that volume of gasoline would be used for only 17 million Sunday drives.

"Both of these areas offer more energy-saving potential without inflicting personal suffering," Mr. Winfield said.

At the same time, W.H. Chadwick assured the gathering that despite a changed marketing philosophy Hydro will continue to ensure that farm customers are given every assistance in the wise and efficient use of energy.

A technical service engineer in the customer relations division, Mr. Chadwick said Hydro is no longer in the "sell more kilowatt-hours business."

He added that drastic changes in the marketing philosophy seem to have created an impression in the minds of some people that Hydro no longer wishes to assist the farm customer.

"Not so," he said. "In fact the changes in our agricultural marketing activities have been fairly minimal when compared to other markets."

municipal briefs

L.A. (Vern) Coles, Ontario Hydro's Northeastern region manager, has been named to the St. Joseph's Hospital board in North Bay.

Sarnia Hydro has lent a helping hand to the city's Sea Cadet corps by offering it storage space for boats and sails in an old substation building. The cadets' gear was being stored in an old waterworks building that is being demolished to make room for redevelopment.

Police in London (Ont.) are investigating incidents involving a phoney utilities inspector. An elderly couple found a wallet containing $15 and personal papers missing and a widow found $10 missing from her purse after a well-dressed man claiming to be a gas and hydro inspector entered their homes saying he was there to investigate high bill complaints in the neighborhood.

Well-known race horse driver Ed Arthur, 67, collapsed and died in his sulky moments after finishing third in the first race at Garden City Raceway recently. Mr. Arthur was a familiar figure around utility circles too, having been long-time chairman of Otterville Hydro.

Southampton PUC has awarded a contract to a Walkerton construction company to build a new headquarters. The contract was for more than $72,000.

Oakville PUC has named Glen A. MacFarlane its manager of engineering and operations. Before joining the Oakville utility, Mr. MacFarlane was with London PUC for a decade and Ontario Hydro for five years.

Sarnia Hydro is considering a cons
energy contest for school children. M
Andy Brandt suggested the competiti
with a $25 prize – to a commission n
ing. He said the best way to make pe
aware of the need to conserve energ
to drum it into their heads at an early a

Bracebridge Hydro worker Richard
rose has been awarded the Royal C
dian Humane Association certificate fc
part in preventing a drowning in the M
waska River in Algonquin Park.

When Ottawa's board of control dro
Len Coulter as one of the city's repres
tives on Ottawa Hydro, it marked the e
an era. Mr. Coulter, 68, has spent ha
life in community service and was a r
ber of the Ottawa Hydro commission f
years, many of them as its chairman.

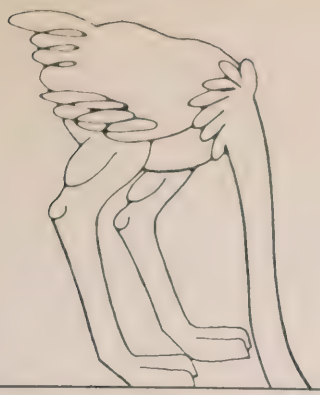
Delhi Hydro's chairman Arnold Sayeà
been named the community's citizen
year. A former mayor of the municip
Mr. Sayeau has been described as "a
being the right man in the right place
right time."

Owen Sound PUC has offered the
Owen Sound Museum a barn. The
owns a barn – but has no use for it
days when line patrol was done on h
back have long gone.

An anonymous telephone call has
the recovery of $335,000 in cheques
from North York Hydro during a robb
May. The cheques, along with $5,5
cash, were taken by two men dress
construction workers.

Windsor Utilities Commission
approved a contract with Ford of Ca
Limited that could result in the utility
the sole supplier of energy for Ford's
sor plants. Sam Archer, Ford's manag
power and utilities, says the compan
decided to increase its use of el
energy because it cannot be assure
adequate supply of natural gas begi
next year.

A 10-day strike by Ottawa Hydro's lin
cablemen and operators has been s
Employees accepted a two-year co
calling for pay increases ranging fr
to 39 per cent.



as don wright sees it

Expertise is nice to have but we are finding our own particular variety a bit of a bind. It all started a few columns back when we attempted to bring our readers up-to-date on significant developments in the wet and wonderful world of the water closet.

Now we are considered experts. We are on the receiving end of all sorts of newsy nuggets bearing, however remotely, on that marvelous mechanism over which most of us are prone to groan for a moment or two each day.

Even worse, we are beginning to receive invitations to cocktail parties from hosts solely intent upon soliciting free advice as to the repair and maintenance of their loose and leaking loos.

No, dear Aunt Isobelle, we will not drop over just for a moment in order to diagnose those funny noises you say emanate from your john even when it is unoccupied.

Experts, of course, are expected to know their subjects inside out and it's the inside that lets us out. We are, if the truth be known, completely ignorant of the mechanics and even the principles behind the gurgling tide that swirls away so many of our problems.

Verging on the cowardly where toilet bowels are concerned, we tend to panic whenever we see the water level creep half-an-inch above normal. Our solution to this situation has always been to replace the lover and remove ourselves as far as possible from the premises. If it doesn't work at least it shifts the problem to somebody else.

Having confessed, we will leave the subject once and for all—except to mention that little guidebook travellers abroad will find invaluable. Called the Good Loo Guide, it tells you where to go in London when you have to.

Utilizing the star method of rating, the guide lists public facilities from Leicester Square to Kensington Gardens with numerous stops in between for short hoppers.

Only one of the many establishments listed wins top four-star rating and, for anyone interested, this is located at Victoria Station beside platform 1. Customers are charged 5p but once inside they have the use of what the (London) Sun calls "the most modern, glamorous and exotic loo in the world." The Daily Mail simply dubs it "Superloo."

Cheapskates are referred to platform 15 where they can do their thing for 2p.

■ We can go too far in this direction, of course. Having sworn off women's lib and water closets—what else is there to talk about?

How about electricity and the delight some folks seem to think Hydro takes in boosting its rates?

Even though we may be on the other side of the fence, so to speak, we have more than a smidgen of sympathy for the two Niagara Falls area families who are turning back the clock about 50 years in order to beat the rising cost of electricity.

In their well-publicized revolt against rates, these people say they will be turning to wood stoves for heat and cooking, propane gas for electricity, oil lamps for lights and any other substitute they can find for Hydro power.

Good luck, but from here it looks very much like that painful process known as amputating the old proboscis in order to spite the rest of one's physiognomy.

We wonder, for example, if these good folk have priced a cord of nice clean hardwood lately—all split and ready for the stove. We haven't seen anyone giving away gasoline or fuel oil lately either, while coal will soon be on a par with the cost of good caviar.

Yes, Virginia, there is no Santa Claus where energy is concerned. We can maybe learn to get by with using less of it but there isn't much hope of finding any great bargains. Ask the boys that buy the fuel that make the Hydro wheels go around. They're still looking.

■ On a somewhat related theme we have the case of Winnipeg Hydro who, at the time of writing, was considering whether or not to include a police commission brochure with their next billing. If the answer was yes then the utility will have helped tell many thousands of customers how to avoid being raped.

Written in the interest of crime prevention by a woman policeman (no comment), the brochure is presumably slanted towards female customers and bears no reference to what some people think utilities have been doing to all of their customers lately via their power bills.

■ There are strange things going on in the Garden of Eden these days and it looks as if Adam and Eve have swapped their apple for a nuclear potato.

In the new scenario the garden is the rustic Rhineland town of Juelich where, at a nuclear research centre, the two original biblical characters may be at the dawn of a new creation in the field of industrial energy.

Eve, in this instance, is a sexy little heat converter and we go along with the abbreviated version of her name. Spelled out it's Einzelspaltrohrversuchsanlage. Linked to a high temperature reactor, Eve turns thermal energy into gas that can be pumped for miles without any energy loss.

Adam keeps out of trouble at the other end of the pipeline. He's a catalysator, of all things, and he releases all the heat put in by Eve. This is in the form of hot water which can be used to make turbine steam for electrical generation.

Pretty neat, on the surface, but what about that potato? They've dubbed the heat source a potato reactor because the fuel elements are about spud size and they are fed in through the top by a hopper. Hot potatoes fall out the other end when they are spent.

■ Before leaving Germany we might just mention that the good burghers over there can be just as silly as we are when it comes to ecology.

Take the Hildesheim case. Town planners there were required to redraw their building plans at an estimated cost of $122,000 so as not to disturb the existing habitat. This was a pond found to be supporting two dozen yellow-bellied toads.

Bet they were hopping mad. □

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the cover

Reflections of neon lights create a colorful, festive abstract for the holiday season.

hydro news, volume 62, number 6

Published by Ontario Hydro, 620 University Ave., Toronto.

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Printed in Canada.

Build now, pay later?

Two imponderables emerge as central to the entire Energy Board proceedings dealing with Hydro's proposed rate increases.

First is the debt-equity conundrum. As a self-supporting institution Hydro operates under a mandate to supply power at cost. It has only two sources of funds; revenue from the sale of power and the debt market. Considering the size of Hydro's building program to meet the growing demands for electricity, some of its funds must be borrowed in order to reduce the burden on present customers. At the same time, specific appropriations to provide for debt retirement and system expansion must be incorporated in annual revenues to reduce borrowing and protect Hydro's long-term financial health. The question is — how much should customers be asked to pay for system expansion now and how much should be deferred through borrowing?

There is probably no optimum debt-equity ratio but Hydro is concerned at the steady rise in the debt side of the relationship. The ratio of debt to equity has risen from 66/34 in 1945 to 76/24 in 1965 and to an estimated 80/20 in 1975. Hydro regards any further movement in this direction as imprudent. In its view, the relationship of debt to equity must be stabilized and to achieve this appropriations must be included in today's rates to reduce future borrowings and to maintain the favorable financial standing of the Hydro corporation in the eyes of the investor.

Maintaining investor confidence is regarded as particularly important at a time when enormous sums are required for energy projects and developers must compete for funds in a limited market. Continuing inflation compounds the problem of financing as investors are more reluctant to commit their funds on a long-term basis. Hydro foresees greater reliance on foreign sources for its capital requirements with a greater degree of vulnerability to international monetary policies.

In addition to alleviating the problem of raising money, capital charges incorporated in current rates do have a salutary effect on the future cost of power. Through reduced borrowing, future interest costs are perpetually lowered.

By virtue of a process of smoothing rate adjustments over a three-year period to minimize the impact of changes, Hydro's original rate proposal for 1976 was less than required to meet full current costs and recover past deficits. In response to the Ontario Government mini-budget of July 7, 1975, Hydro recommended a further reduction by deferring the collection of past deficits by one year and arbitrarily cutting in half the system expansion charge for 1976.

The amount of the appropriations for debt retirement and system expansion that should be recovered through revenue, in the best interests of the electrical customer, is likely to remain at the heart of any inquiries into the fixing of electrical rates.

A second broad area bearing directly on costs and, eventually, on rates, is the size of the system expansion program. How fast will the electrical load develop and what is the appropriate reserve Hydro should build into its system?

The need for a major generating station must be determined 10 to 12 years in advance of its in-service date and during that time load growth will be influenced by several factors — some of them off-setting others.

For example, continuing emphasis on anti-pollution measures, such as recycling, together with the prospect of a scarcity of fossil fuels, may accelerate a swing to electricity. On the other hand, while it is difficult to predict the long-term effect of the conservation ethic on the demand for electricity, it must be regarded as a moderating factor on growth.

And while Hydro has enjoyed a good track record in forecasting load growth in the past there is scope for a wide divergence of opinions considering the number of unknown quantities involved in dealing with the future.

Reserve margins are directly related to system security and here, too, Hydro has had to compromise in order to meet a requirement to shave a minimum of $1 billion from its capital program between 1976 and 1985.

In order to establish the amount of reserve capacity required on a system it is necessary to adopt a standard against which reliability can be measured. Hydro has traditionally adhered to a standard employed by many North American utilities whereby the system will fail to meet the load requirements imposed on it not more frequently than one day in 10 years. In reducing its capital program Hydro has increased the loss of load probability by as much as 10 times the customary criterion over the next 10 years.

In summary then, Hydro wants to ensure its ability to maintain a high level of electrical service and it is concerned with any measures which, in its view, could impair its financial health and unrivalled credit standing.

How much should Hydro build and how should it be paid for? These are the central issues. Simple enough to be couched in a sentence, the questions are sufficiently involved to tax the experts and defy a consensus among them.

The problem in planning, of course, is with the crystal ball. It just hasn't been developed to the point where it can be employed as a precision instrument. Until such time there will be divergent opinions and utility planning will be limited to the objective application of available expertise and knowledge — with all the imperfections this implies. □

Energy Showcase

The sweeping glass facade of Hydro Place, Ontario Hydro's new head office building, reflects its surroundings at University avenue and College street in Toronto: Queen's Park, hospital and university buildings, traffic, clouds in the sky . . . even a passing aircraft.

But, as well, the mirror glass encloses a package of design innovations by Canada Crescent Corporation (formerly Canada Square), developer and builder of the project, that are attracting widespread interest.

They include new techniques for conserving energy and materials while providing a comfortable, modern office environment which makes use of the maximum possible amount of floor space in a 20-storey building. Total floor area is 1.3 million square feet.

The new building at 700 University avenue, on the site formerly occupied by the Royal Conservatory of Music, provides accommodation for about 4,850 Head Office staff housed at 620 University avenue and six other widely-separated buildings. The building has a total capacity of about 6,000 office workers.

It has a ground floor lobby, a mezzanine floor, 18 office floors, and an upper and lower concourse. Banking services are provided on the ground floor, while a variety of shops and restaurants in the upper concourse look out on a multi-level plaza landscaped with trees and shrubs.

There are two escalators from the TTC subway to the street level and a glass-domed walkway along College street from the escalators to Hydro Place. A tunnel connects the new tower with Hydro's buildings on Murray and Orde streets, which house computer facilities.

Hydro Place adds a new dimension to the institutional atmosphere of University Avenue. The shops, restaurants and landscaped areas of the new plaza have been designed to encourage people to stop and browse. They add warmth and life to the formality of the statues, manicured boulevards and imposing office structures characterizing this handsome downtown artery.

Hydro will eventually become owner of the new building.

Under a lease-purchase agreement, Canada Crescent assumes all the responsibilities and risks of financing, design, construction, and operation of the building for the next 30 years, at which time Hydro takes over ownership of the building for $1.

A major advantage of the leasing agreement is that Canada Crescent finances construction costs. Hydro makes no capital outlay for the building.

The agreement thus enables Hydro to avoid borrowing funds for this purpose at a time when large amounts of capital are needed for new generation and transmission facilities.

Hydro gets an attractive head office for three decades in return for an annual rental payment to Canada Crescent of $4.84 per square foot, which includes base maintenance costs. This rate excludes the value of the land, municipal taxes, utility charges and annual fluctuations in maintenance expenses due to rising costs. Allowing for these charges, the total rate per square foot amounts to $7.84 and compares very favorably with rental rates in the downtown area.

The cost of space at 700 University avenue is essentially the same as the rent Hydro has been paying at 77 Bloor street west. But the new head office costs include many important facilities not provided at the Bloor street location such as an auditorium, conference rooms, library, vaults, computer terminal rooms and printing plant facilities. Most important, under the agreement with Canada Crescent, the cost of space remains partially inflation proof for 30 years.

Although Toronto office rental rates will undoubtedly rise in the ensuing years, Hydro's payments to Canada Crescent remain fixed except for possible fluctuation of maintenance costs, municipal taxes and exchange rates on foreign borrowing.

There is also a real saving in staff centralization. Hydro estimates the annual cost of transportation and time lost in travelling from one location to the other at $800,000. This could be considered as a reduction in the cost of accommodation.

Surplus office space not required by Hydro is available for rent at commercial rates. As well, Hydro shares in any profits accruing to Canada Crescent from the commercial area of the building, offsettin part of its rental costs.

As the building is not owned by Hydro, only the estimated cost of construction provided by its consultants is available. This estimate, based on an assessment o the materials, labor and overhead involved, including design fees and the cost of interim financing, amounts to $44,700,000 compared with the original estimate of $44,400,000.

How do you conserve steel and concrete without sacrificing usable space? Hydro Place designers came up with the answers.

The building has what are believed to be the world's largest continuously post-tensioned concrete floor slabs. The post-tensioning technique resulted in large savings in steel and concrete, both of which are energy-intensive products, anc a significant increase in usable space.

The floors are relatively thin, nine-inch post-tensioned slabs, each containing 1,600 cubic yards of concrete. Seven-wir steel strands sheathed in polyethylene tubing are used as pre-stressing tendons in the concrete. More than 20 miles of tendons are anchored in every slab, each of which provides approximately 54,000 square feet of floor area.

When the lightweight concrete mix hac reached the required strength of 4,000 pounds per square inch about 36 hours after pouring, the embedded steel tendor were tensioned by a two-man crew with end-stressing jacks.

By using this technique instead of stee framing designers saved 20 inches in height on every floor or at least two storie of usable space in the 20-storey building. At the same time they provided for a larg floor plan while conforming to height restrictions of 240 feet at the site.

Another interesting feature is the use c round, interior concrete columns, rangin

Efficiency, economy and people are key components of Hydro Place





in diameter from 52 inches in the basement to 24 inches at the roof, each set back 12 feet from the perimeter. This design gives occupants an unobstructed view through the windows and permits more flexible use of space for office landscaping.

Hydro Place is attracting many visitors who are looking for ways to save money on their energy bills. Five features make Hydro Place a pacesetting example of an energy-conserving building.

□ Efficient thermal design has been achieved through installation of double-glazed reflective glass — two thicknesses of glass, one of which is coated to reflect solar heat outward and indoor heat inward — and insulation either to conserve heat or to reduce energy use for cooling, depending on the time of year.

□ The lighting load has been reduced about 33 per cent by integrating fluorescent units with reflective, V-shaped coffered ceiling panels. To provide 100 foot-candles of illumination at desk level, only 2.7 watts per square foot are used, compared with 4 watts per square foot called for in most office buildings.

This reduction in lighting requirements results in substantial savings in operating costs and by using light as a source of heat, as explained below, further economies are achieved.

□ An internal-source heat pump system captures heat from lights, people and equipment in the core area for perimeter heating in winter. The system reduces energy costs by storing and redistributing heat usually expelled to the atmosphere.

□ An underground storage reservoir containing 1.6 million gallons of water — the largest known energy conservation tank in existence — stores heated and chilled water for use as required.

□ A centralized computer control system monitors, controls and optimizes operation of all mechanical and electrical equipment.

The multi-purpose ceiling panels provide soundproofing, cooling and power access points. Return air flows through slots along each side of light fixtures to prolong their life, while between panels are access points every four feet for slim, movable power and communication poles.

Designers estimate that total energy consumption (excluding snow melting, but including hot water for washrooms and cooking) will be less than 54,000 BTUs per square foot per year. On the average, a well-designed building of similar size uses more than 120,000 BTUs.

Savings in annual energy consumption are estimated at 20 million kilowatt-hours, enough to supply 2,500 average-size homes.

The energy-saving system has two additional advantages:

□ The heating and air conditioning system uses chilled and warm water produced at night and in other off-peak periods, thus reducing energy requirements at times of maximum demand on the Hydro system.

□ Because of the building's efficiency, heating, ventilation and air conditioning equipment is 30 per cent smaller than in other equivalent buildings.

Reflective glass and insulation have been used to reduce energy requirements for the building.

Although the glass curtain walls appear like unbroken expanses from outside the building, they consist of window areas separated by reflective glass sections known as spandrels. The spandrel sections are backed by a two-inch layer of glass wool to insulate a Canada Crescent-designed wall heating duct described below.

To reduce heat loss and minimize energy use, the mirror walls are designed to equal normal masonry walls in insulation value. Window units consist of twin panes of glass separated by an air-tight seal.

The outer pane, made of special light and heat reflective glass, has a silver coating on its inside face. This coating reflects 80 per cent of the solar heat, twic as much as conventional glass, and significantly reduces the summer coolin load. In winter, the glass and coating reduces heating requirements by contair ing interior heat within the building.

The curved mirror glass facade of the building faces northeast, a siting decisio that reduces the effects of solar heat and winds on heating and air conditioning loads. But the southwest wall, a curtain o ribbed concrete, is designed to withstan even greater extremes of heat and cold from sun and wind, while perpendicular window strips provide view and light.

Behind the ribbed concrete panels use to clad the rear of the building is a one-inch layer of urethane insulation and a layer of reflecting foil attached to the inn concrete wall. In other places, where there's no structural concrete wall, the concrete panels are backed with four inches of rock wool protected by a vapor barrier and interior wallboard.

Hydro Place has no furnace or heating plant; instead, lights, people and equipment are the main sources of heat. Esser tially, heat removed from the core area, which requires year-round air conditioni in large office buildings, warms the perimeter during winter.

The heart of the internal-source heat pump is the compressor in each of the tw centrifugal refrigeration machines. Thes contain a refrigerant gas which is alternatively vaporized through pumping to create heat and liquefied to give it up. In brief, the heat pump provides refrigerati at one end and useful heat at the other.

The system works much like a household refrigerator, which has cooling coil inside and a radiator, usually located on the back surface, to reject heat. But in th case hot and chilled water are obtained from heat exchangers in the evaporator and condenser sections of the refrigera-

Office landscaping permits flexible use of work space in Hydro Place. Clockwise, photos show reception area, lounge and landscaped offices.

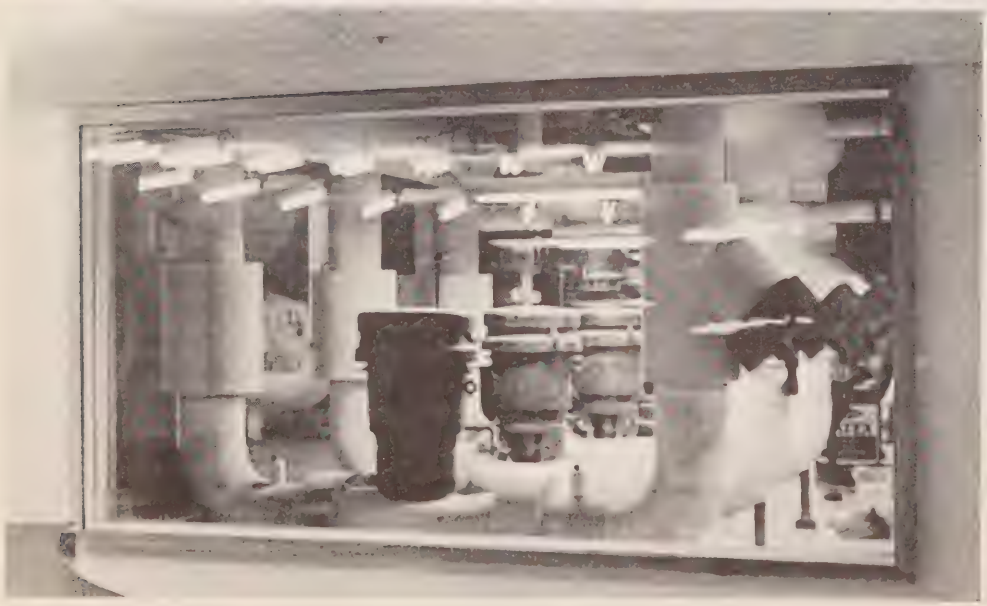






Bank facilities are provided in lobby, above.
Below, internal-source heat pump system, which captures heat from lights, people and equipment, replaces furnace.





tion machines for storage or for distribution throughout the building.

Hot water reheat coils installed under the floor around the perimeter use hot water extracted from the twin heat exchangers on the water chillers or from th underground storage tank. This heated air passes through a slim, insulated air passage integrated with the wall structur to save floor space, and rises through slits at window level. The warm air flows along the windows and up through ceilin slits for re-use.

Meanwhile, the core area is cooled wit 13°C air from two fan rooms situated on each floor — another spacesaving featur (Depending on their height, high-rise buildings usually devote one or more floors to mechanical equipment.)

In the fan rooms, return air, tempered with outside air, is cooled by passing ove water-filled coils containing chilled wate This water comes from the evaporator section of the water chillers or from the storage tank.

Cool air is distributed through ceiling slits via 18 variable air volume terminals on each floor, each with its own tempera ture control. In summer, the reheat coils are by-passed and cool air flows through the perimeter duct as well.

Two fan units located in a roof-top equipment building supply ventilation or additional fresh air through two concrete shafts running vertically through the buil ing. These units supply clean, dehumidified air to the fan rooms at a temperature automatically set by the building's centra control system.

The thermal storage reservoir, a three sectioned concrete structure built under the floor of the sub-basement, holds enough water to fill 80 residential swimming pools. It contains an elaborate system of baffles controlled by sensing devices.

The tank, measuring about 120 x 90 x 20 feet deep, is one of the key elements i the energy-conserving system designed by Canada Crescent. Excess energy generated in the building can be stored t provide heated or chilled water as re-

uired from the three-in-one reservoir.

During weekends or unoccupied eriods in winter, the reservoir stores nough heat to maintain adequate tem-eratures in the building. In summer the ntire tank can be used for cooling.

A number of office towers use compu-ers to measure and record conditions, ut the Hydro Place facilities actually perate and control heating, ventilation nd air conditioning systems as well.

Canada Crescent's Computer Optim-ed Energy Control System, as it's known, rovides a total memory capacity of 6.5 illion units of information, which in-ludes operational data and current eather reports.

More than 800 sensors are located roughout the building and within the nergy bank. With this information, the ystem starts and stops fans, resets emote temperature controls, operates arms and other equipment.

It selects the most economic programs r heating and cooling on any particular ay and optimizes electrical demands use off-peak power for storing energy the underground reservoir.

The computer also makes best use of eam purchased from the nearby Univer-ty of Toronto for snow melting in winter id to defray the cost of the steam line, r heating hot water for washrooms and tchens. To save energy, temperature washroom water is controlled by pre-ixing.

The computer control system has been signed to respond quickly to weather anges. If clouds gather and obscure the n on a cold day, for instance, sensors ll for heated water from the energy bank compensate for the temperature drop.

Other features of the building include fire protection and elevator systems, mezzanine floor and its use of office ndscaping to make flexible use of floor ace.

The building has an automatic sprinkler stem, floor fire hoses and facilities to ntrol and exhaust smoke. Alarm signals n be triggered manually, as well as by at or smoke sensors. Three stairwells provide exits from each floor. Plans call for a fire warden organization and a co-ordinated public address system.

Because of the independent air handling facilities on each floor, the building has what's known as a compartmentation system to control fires. While staff leave the fire area by stairwells, the affected floor can be sealed off to control the outbreak and to exhaust smoke.

The building is served by 16 passenger elevators automatically operated under computer control. When necessary, they can be transferred to manual control from the lobby.

Though all elevators can serve the lower concourse, they in general start at peak hours from the upper concourse and the main lobby only. Eight will serve floors 2 to 10 and eight will serve floors 11 to 19.

The low-rise elevators and the high-rise elevators are further sub-divided at peak hours into two banks of four, serving respectively those floors in the upper half and the lower half of the levels normally served.

Under other than peak load conditions, all the high-rise group provides service for passengers moving from low-rise floors to high-rise floors and vice versa, thus eliminating any need for a crossover from one bank of elevators to the next.

A continuously operating vertical conveyor carries mail and other material to office tower floors, which is also served by a freight elevator. Other elevators provide service to the upper and lower concourse and the auditorium.

Electricity for emergency operation of elevators and lights is supplied by a diesel-generator set.

A library and a 200-seat auditorium, equipped with special projection and lighting facilities, as well as adjoining conference rooms, are located on the mezzanine floor. The library provides a reference centre where members of the public can review documents of interest to them, and the auditorium is available for rent to various organizations.

Two pleasant, landscaped terraces are located on this floor adjoining the auditorium and will be accessible through large plate-glass sliding doors.

Office landscaping is a modern method of making the best use of available floor space while providing flexibility in situating work groups to meet changing needs.

The concept is based on the idea of the office as an intricately inter-related communications system. Instead of partitions, attractive screens and planters are used to provide a degree of privacy, to guide traffic and to muffle sound.

The decision to use office landscaping was based on extensive research and complex team planning. Studies indicate office landscaping improves communications, speeds work flow within the office, and permits relocation of staff members with a minimum of dislocation and expense — an important consideration under conditions of rapid change and rising costs.

To sum up, much criticism has arisen over the lease-purchase agreement for the new building, but Hydro remains convinced that the contract with Canada Crescent is financially and economically sound.

Hydro obtains a first-class building to accommodate its scattered Head Office staff at rental rates that remain (except for fluctuations of caretaking costs and exchange rates on foreign borrowing) fixed for 30 years and compare favorably with current market prices. At the end of the 30-year period, Hydro becomes the owner of the building at a cost of $1.

The risks of escalating construction costs and interim financing are borne entirely by Canada Crescent. As well, Hydro will rent surplus office space at commercial rates and obtain a share of any profits accruing to Canada Crescent from the development of the commercial area of the building, thus reducing its rental costs.

Since the lease-purchase agreement was made, construction costs and interest rates have risen substantially. Thus over a period of years the agreement will result in a saving of many millions of dollars for the power users of Ontario. □



TREES

A bit of the beast lurks behind their beauty

by Rae Hopkins

think that I shall never see
poem lovely as a tree . . .

It was back in 1913 that U.S. soldier-oet Joyce Kilmer penned these famous ords.

Perhaps Kilmer never visited any of the 800 square miles served by Ontario ydro's Bracebridge area staff but if he ver did he could well have been inspired write Trees right in the heart of Ontario's acation land.

For the topic of his poem abounds. here is an average of about 360 trees to ach mile of line in the Muskokas, amid e hundreds of sparkling lakes, on the lands in them, and along all the access utes to the cottage country.

Indeed, no less than 25 species are ative to the area, ranging from lofty pines easuring up to 150 feet to numerous arieties of both soft and hardwood roducers.

In fall, summer's maze of green ecomes a blaze of color from oranges nd golds to brilliant reds.

And in winter with a hint of silver on eir boughs they take on the appearance a Christmas card come to life.

There's a fascinating beauty for all asons here in one of the best treed eas in Ontario.

But to the crews responsible for main-ning reliable electrical service to the ,500 customers in the area a bit of beast blended with the beauty.

For trees are a thorn in the side of acebridge area staff.

Area manager Pat Freeburn says the mber and duration of outages caused trees "are matters of grave concern to e entire area staff."

He adds that in the last six months of 73, there were 320 interruptions to rvice in the area caused by trees and in 74 trees were the culprit in 454 outages.

The problem is compounded by the fact t of the 18,500 customers served by area, more than 70 per cent of them cottage customers hence tree trim-ng is a "no-no."

While trees are a real problem to the acebridge area staff, Mr. Freeburn says that they can appreciate the point of view of the cottagers.

"To these customers a tree is a thing of beauty — even when its branches encroach on power lines — a majority of these people live in apartment buildings in the Toronto area, trees can be about as scarce to them as teeth are to hens."

But beauty doesn't make life any easier for the foresters and linemen who must keep the power flowing.

Because of the nature of the surroundings, access to many of their work locations is only by water and air. And because of the type of terrain they must traverse — it's a rough landscape to mortals other than perhaps billy goats — an element of danger always exists.

Area forestry foreman Clare Taplin suggests there's a general misunderstanding of Hydro's tree trimming policies on the part of the cottage-owners.

"Somehow they seem to think we're going in there hacking down everything in our path. In fact, more than 75 per cent of the trees with branches encroaching on lines are trimmed and left standing.

"Of the fewer than 25 per cent that have to be removed, 5 to 10 per cent of these are felled because they've died of natural causes. Tree disease can spread to other healthy species, so it's in the property owners' best interest that they be removed."

Mr. Taplin, with a quarter-century of running the area's forestry department to his credit, says unhealthy trees constitute a definite hazard to the continuity of electrical service to the area.

"Many of the trees in this part of the country are shallow-rooted, some are decayed, and all are exposed to high winds. When conditions such as this prevail, they can — and do —fall over lines and bring them down."

And he adds the Bracebridge area is known to be particularly susceptible to lightning.

Mr. Freeburn injects that "coming from Western region (that's southwestern Ontario), a shallow-rooted tree meant nothing to me until I saw a few topple.



Forestry sub-foreman Paul Callacott uses a hydraulic pruner to trim a soft maple encroaching on a 44-kV line in the Baysville area of Muskoka.



Mr. Taplin adds that what the custome overlook is the fact that when a wire gets entangled in a tree, the tree itself becom alive if conditions are right, for example, if it's wet. The tree is then as dangerous a the wire itself.

Mr. Freeburn says he's written to more than 50 cottage-owners' associations offering to attend their meetings to expla Hydro's tree-trimming and line-clearing policies. But there have been few takers.

He says, however, that after a power interruption, attitudes tend to change an owners let forestry crews on to their properties to trim the trees so lines can be repaired.

"We'll never reach the point where we can say everyone is aware of and appreciates our problem with trees. One of the reasons for this is that we're getting more intermittent residential (cottage) customers every year, therefore it becomes more difficult to obtain permission to trim trees.

"It's also pretty easy for people to ask us why we don't go underground. In this country!"

(As it is, the amount of rock in Muskok makes it two-and-a-half to three times more costly to build a mile of overhead line that it does south of Barrie).

Since Hydro values trees as much as the Muskoka cottage-owner, it has embarked upon one of the largest reforesta tion programs in the province. (Oddly enough, despite the vast number of trees in the area, there is an over-abundance i some parts, and a scarcity in others.)

Trees are used for screening road crossings and facilities such as generating and transformer stations—and yes—transmission lines too.

Crews in Bracebridge area have planted more than 4,000 trees to help screen tower bases along the Extra High Voltage line that runs from the James Ba watershed to just north of Metro Toronto They've used them to screen their servic yard from a neighboring subdivision.

For, to paraphrase Kilmer, Hydro's crews have never seen a power facility a lovely as a tree. □

Demonstrating Safety



by Bob Morrow

Walter Inkis stands on top of the 40-foot trailer parked under a 500 kV line near Barrie, squints into the sun and calmly unfurls an umbrella under a clear, blue sky.

A funny thing to do? Perhaps, but Mr. Inkis, who is a development engineer in Ontario Hydro's line maintenance department, has a serious purpose.

The umbrella is a prop for one of a series of demonstrations to illustrate the safety of working directly under an extra-high-voltage line. This idea, to illustrate electrostatic charges induced by the electric field, comes from Japan where farmers who cultivate their fields under power lines use parasols to protect themselves from the sun.

Although the line carries 500 kV (500,000 volts), measurements show that the electric field strength decreases to near zero at ground level. At five feet above the ground and directly under the lowest point of the conductors, the electric field strength is about 5,000 volts per square metre.

Supposing you were riding on a load of hay passing under the lowest point of the EHV cables, what would it feel like to be exposed to an electric field strength of 10,000 volts per metre about 17 feet above ground?

To find out, the writer stood on the trailer roof, grasped the plastic umbrella handle and gingerly placed a thumb on the metal shaft. I first felt a momentary tingle that ceased as long as I kept my thumb on the shaft and then sensed what seemed like a continuing cool breeze on my arms from static electricity.

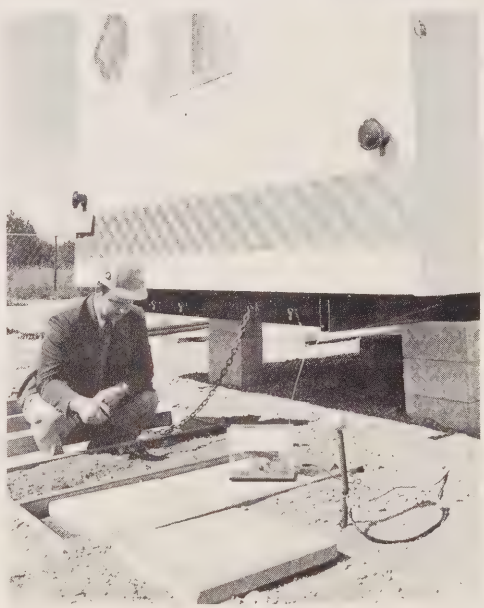
It didn't take much courage. Hydro linemen regularly work on EHV and lower-voltage lines with bare-hand techniques or live-line tools. Both methods involve work close to conductors where the field is strongest. A large number of Hydro's staff of about 1,000 linemen have been doing this sort of work since the 1950s. Independent medical studies of linemen who have worked for years in strong electric fields close to conductors show they have experienced no ill effects.

One such study, conducted at Johns Hopkins University in Baltimore, Maryland,

Clockwise, from upper left, Walter Inkis carries out safety check on typical farm fence erected beside extra-high voltage line at Essa test site, adjusts TV set for good quality picture, demonstrates that wire netting attached to cage can provide shielding for farm buildings close to lines, and prepares to show how length of chain effectively grounds farm vehicles.









involved 10 linemen who had worked on 345 kV lines for 10 years and were found to be in excellent health.

Walter Inkis' "stage" is a new demonstration-test centre located across the road from Essa transformer station, about six miles west of Barrie. The station is the key point on Hydro's 500 kV transmission line linking hydro-electric stations in the James Bay watershed with the Toronto area, which has been operating at this voltage since 1967.

The Essa centre forms another link in Hydro's program to encourage multi-use of transmission line routes for various purposes, particularly farming. Demonstrations are being held this fall for officials of Ontario farm organizations and next spring groups comprised of up to 50 farm residents will visit the site.

The Essa program is designed to allay concerns expressed at public meetings held to discuss routes of future transmission lines as part of the public participation process.

Besides the umbrella, Walter Inkis uses an assortment of other props, such as an electrostatic generator, a TV set and antennae, an AM-FM radio, fluorescent tubes, chains, and even a watering trough. He also has an array of sensitive measuring instruments, including electric, sound and ozone meters.

"We hope to use a tractor and a combine as well as irrigation pumps and lengths of pipes to simulate farm situations," said Mr. Inkis.

He said members of the public who visit the site will be introduced to various electrostatic and electromagnetic effects encountered under high-voltage lines.

"It will be shown that most of the noticeable effects are of an annoying nature rather than an actual hazard," he said. "Means of eliminating or reducing the annoyance will be pointed out. Where a potential hazard does exist, it will be pointed out how it can be avoided or eliminated."

The Essa facilities include a small auditorium and display area built around two trailers. Three common styles of farm fences, 700 feet long, have been erected to demonstrate electrostatic and electromagnetic effects. A pond in a gravel pit, located south of the site, will be used for irrigation spray demonstrations under the operating EHV line.

Hydro has long been recognized as a pioneer in EHV transmission research, and has accumulated years of experience in construction, operation and maintenance of EHV lines.

In 1959, about 30 miles northwest of Essa, Hydro built the first three-phase experimental line on the continent to operate at voltages up to 600,000 volts. I an outdoor laboratory at Coldwater, Hydr researchers studied and measured radio interference, corona losses and other technical problems.

The first EHV line in Ontario, built duri the 1960s, incorporated features to cont corona, reduce radio interference and

Farmers have their say in Hydro's planning

void excessive power losses.

Corona, visible at night as a luminous low unless it's controlled, is caused by onization of the air close to conductor ables. Control was achieved by a com-ination of factors built into the EHV line, ncluding conductor cables in bundled ormation and hardware of special design.

New construction techniques were also volved to string conductors between owers without scratching the cables. The eason: Scratches would increase corona, esulting in power losses and radio inter-erence along the 500 kV line.

Crops have been planted, grown and arvested while cattle have been safely astured under the EHV line since it began perating, as they have under lower-oltage lines for many years.

Coupled with new research programs utlined in the accompanying article — nd an open approach to problem-solving n co-operation with farm groups — the ssa program will demonstrate that Hydro id its homework in the design and con-truction of the EHV line, but it's keeping n open mind about public concerns.

Walter Inkis, who has worked on eveloping procedures for training line-en to work on live lines, believes con-ern about EHV lines stems from fear of e unknown.

He's preparing for all sorts of questions, om farm groups. For example, is it safe let cows use a watering trough under n EHV line?

The answer is yes, he says, if you place e trough on the ground or on a metal and.

By frankly answering questions from rm groups at Essa, Hydro plans to dem-nstrate not only its concern that its EHV es are safely operated but that through fe practices, hazards that may exist n be avoided.

Ontario Hydro has opened a new pathway to respond to public concerns and encourage deeper public involvement in long-range planning for new power facilities.

Recognized leaders of provincial farm organizations have formed a group to help define the nature and extent of Hydro's impact on the agricultural scene.

The advisory group, which sounds like a who's who in Ontario farming, includes representatives of six organizations — the Ontario Federation of Agriculture, National Farmers Union, Christian Farmers' Federation, Ontario Soil and Crop Improvement Association, Ontario Beef Improvement Association, the Ontario Institute of Agrologists and the Ministry of Agriculture and Food.

"We're sitting down with farm people and starting from square one in trying to work out a completely open process of planning," says David Cressman, a professional agrologist and senior environmental analyst in Hydro's Forestry department who is a soils specialist. "We don't have all the answers yet but we're sincere in wanting to get answers to legitimate questions."

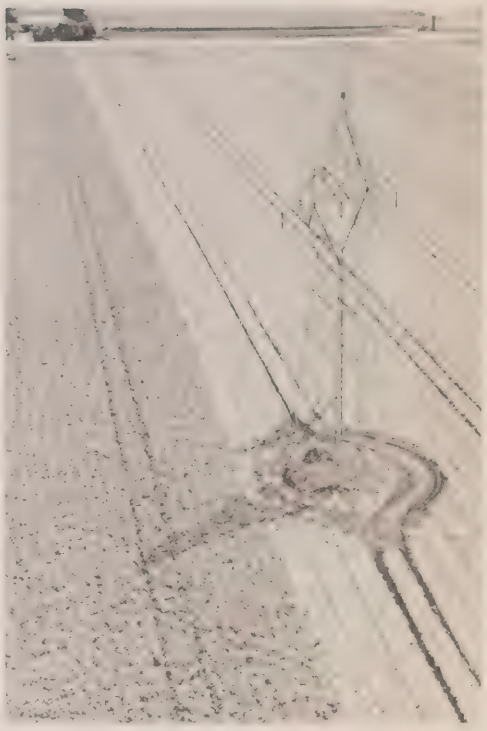
Several studies have been launched by Hydro to get answers to questions raised at public hearings into future transmission line routes and other studies are being considered. Not only are farm representatives posing the questions but they are co-operating in suggesting research projects and in evaluating results.

Parallel studies conducted at the Ridgetown and Kemptville colleges of agricultural technology in co-operation with the Ministry of Agriculture and Food illustrate a fact-finding approach to potential problems.

These studies are inquiring into the effects on the efficiency of farm machinery operating around transmission towers; the best placement of towers in fields in relation to fence rows; the effects of single and twin tower lines, and the clearances required to permit vehicles like tractors to pass between tower legs.

Two major questions deal with how much farm land will be taken out of production and the net effect on farm income.

Tower causes minimal disruption to cultivation of crops.



The scope of the Ridgetown studies, completed last year, has been widened at Kemptville, where researchers are monitoring actual operations of about 40 farmers working under transmission lines in a mixed farming area northeast of Brockville. Fields used for corn, small grains and hay are included.

Results of the Ridgetown study will be combined into a final report when the Kemptville work has been completed this fall. "We feel we will have quite conclusive answers to a number of the questions raised when we receive the results of the two studies," says Mr. Cressman.

The Solandt commission, which held hearings into the proposed Lennox-Oshawa transmission line, found agreement among farmers that just over one-tenth of an acre around a tower base couldn't be effectively cultivated. Ontario Hydro then caculated that the entire line which extends for 120 miles, would take about 112 acres out of cultivation.

How much farm land is taken out of production around transmission towers? Photos show harvesting of crops around EHV towers, tobacco kilns situated under transmission lines and tower set in orchard.







Dr. Omand Solandt said in his report, however: "Judging by the cultivation that the Commissioner has seen around tower bases, the actual amount lost would be considerably less."

The Ridgetown studies indicated the loss of farm land around each tower would be less than one-tenth of an acre. The highest crop loss for silage corn was estimated at about $30 per tower, including lost crop production and reduced efficiency in using machinery. Weed control costs would be extra.

Other studies are seeking answers to questions of serious concern to farmers: Do extra high-voltage lines have harmful effects on farm animals and crops? How can farm yields be protected from possible damage during line construction?

A preliminary study has begun under Dr. P. B. Little at the University of Guelph's Ontario Veterinary College into possible effects on animals, which may be expanded if necessary.

Meanwhile, a study of the possible effects of electric fields on plants, anima and soils is being conducted in the U.S. at Pennsylvania State University. This three-year $375,000 project funded by th Electric Power Research Institute (EPRI) —an organization backed by major U.S. utility systems — is being monitored by Hydro and information is being exchanged with the U.S. body.

Hydro is attempting to avoid duplicatic of effort in the Guelph and U.S. studies, said Mr. Cressman.

The effects of soil compaction by construction vehicles on farm yields is being studied in a three-year project for Hydro by the University of Guelph's Department of Land Resources Science under Prof. Len Webber.

Test sites have been established at Nanticoke generating station, where cla soils are found, and at Buchanan transformer station at London, an area noted for dark, rich loams.

Here researchers are checking on problems of rutting by vehicles, compaction, and possible damage to field drainag tile. Remedial measures are being studie such as using straw, regrading with top soil, chisel plowing and planting. Crops such as corn and alfalfa are being grown in the test plots.

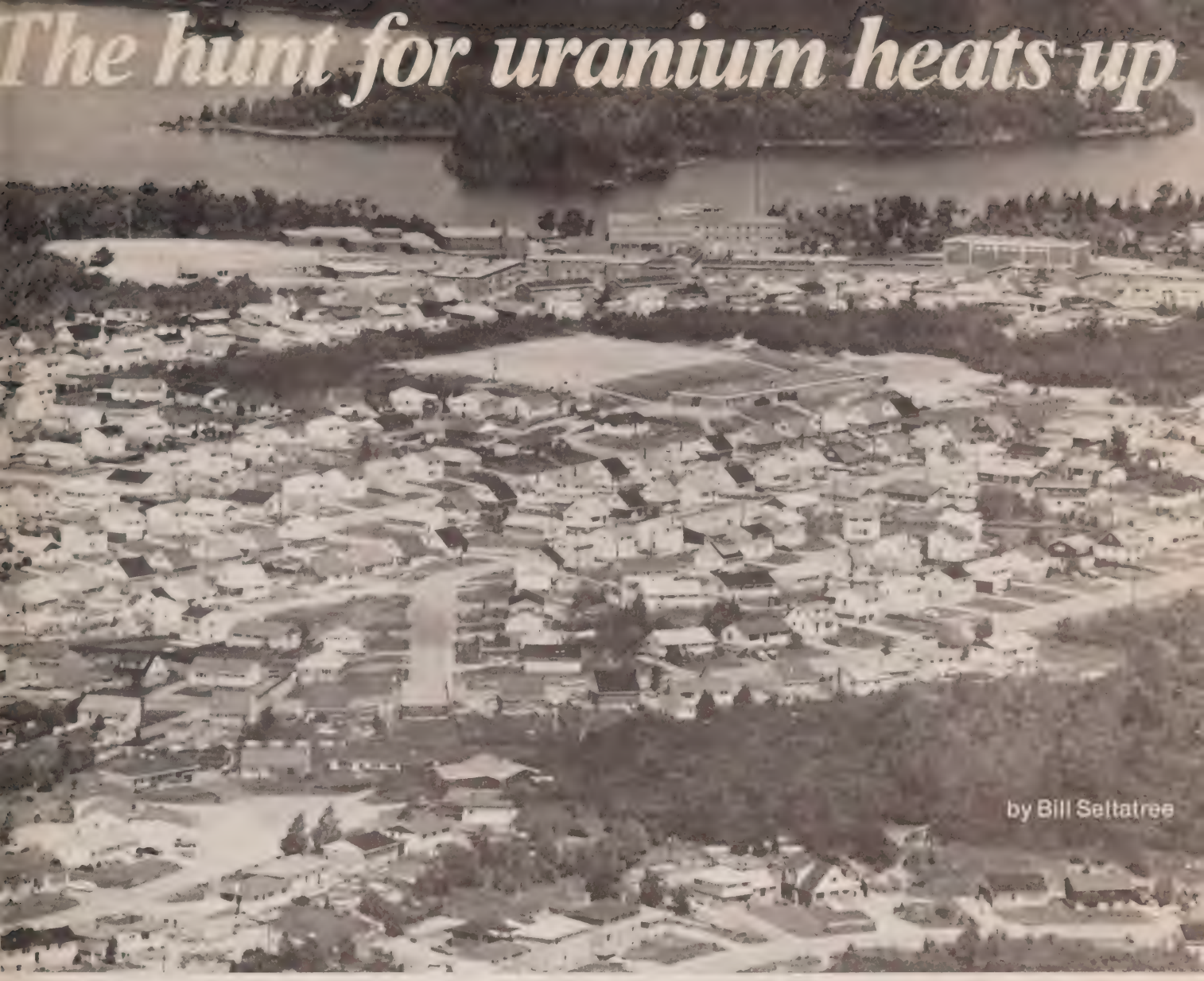
Besides these studies, Hydro is considering research into specific areas, suc as tobacco growing, fruit and vegetable farming, and use by farmers of crop-dusting planes to spray crops.

Mr. Cressman said the studies will provide a solid basis of facts for evaluating Hydro's impact on agriculture in Ontario—facts that have been arrived at openly in co-operation with farm community leaders.

The farm advisory group will play a similar role in accommodating agricultural concerns during the Porter royal commission hearing into long-range plar for generating and transmission facilities in Ontario. □

The hunt for uranium heats up

by Bill Seltatree



Elliot Lake: where new growth appears destined.

eiger counters and pick and shovel pros-ecting techniques are now being aided by rcraft and the latest in technological quipment as efforts are being stepped up find new uranium deposits in Canada.

The Geological Survey of Canada, a art of the federal Energy, Mines and esources department, has launched a l-year uranium reconnaissance program co-operation with the provinces.

Ontario and Saskatchewan have been lected for the first year's studies and icials hope to survey about 70 per cent the entire country's 3.86 million square les within 10 years.

The impetus to the nationwide recon-issance program is provided by the idly growing demand, both in Canada d abroad, for uranium. Recent forecasts ggest that world demand for this reactor l will exceed existing production capacity in the early 1980s. Canada accounts for about 20 percent of world supplies and although its uranium policy gives priority to domestic requirements, there is growing concern that the country will have trouble meeting commitments if action isn't taken now to develop new reserves.

Although much of Canada has already been explored for uranium potential, instruments and methodology were often not sensitive and accurate enough to yield useful data.

The new survey, now under way, employs a system known as airborne gamma-ray spectrometry over areas with relatively flat topography. Regional geochemistry is used in mountainous areas where flying is impractical.

Arthur Darnley, director of resources for the geophysics and geochemistry division of the geological survey, says the gamma-ray spectrometry technique was developed jointly by his department and Atomic Energy of Canada Limited. An experimental program was undertaken in 1969 and proved quite successful.

Mr. Darnley notes that the gamma-ray spectrometer can differentiate between the radioactivity levels in potassium, radium and thorium. Radiation is measured by flashes of light on special sodium iodide crystals which are translated to electronic impulses which can then be interpreted to indicate the source of the radiation and can thereby pinpoint areas where uranium is likely to be found.

Mr. Darnley says the device is far more accurate than the best commercial equipment available.

Geochemistry studies involve sampling lake and stream waters and sedi-

Rio Algom's New Quirke mine at Elliot Lake is undergoing a $76 million expansion which will be completed in 1978. The program will increase ore production from 4,500 tons a day to 7,000.

ments and analyzing them for uranium.

The 10-year study is expected to cost about $18 million and according to Mr. Darnley, "That's small potatoes in comparison to what will have to be spent in total by government and industry to find the uranium Canada needs." Ontario Hydro's fuels experts are keeping a watchful eye on the studies.

Under federal policy announced last fall, utilities are expected to arrange for sufficient uranium to fuel their reactors for 15 years. Hydro's nuclear program was established prior to this policy and it has established fuel contracts running for up to 10 years into the future.

Hydro's agreements for future supplies total 6,197 metric tons of uranium (8,616 short tons of U_3O_8). From 1976 to 1979 deliveries will total 2,273 metric tons of uranium, approximately 90 percent of which will come from Rio Algom with the rest coming from Uranerz Canada in Saskatchewan. These deliveries, with some additional minor purchases, will meet the requirements during the four-year period.

Between 1980 and 1985, deliveries covered by current agreements with Rio Algom and Gulf Minerals will total 3,920 metric tons of uranium and will meet about 35 per cent of the requirements. Negotiations have been under way for some time to obtain additional supplies.

Part of the problem in securing these reserves involves the prices being charged for the product. A pattern has emerged in the foreign market where the supplier demands world price at the time of delivery or a floor price, whichever is higher. Hydro has felt that these terms could well turn out to be unreasonable for domestic users.

"Ontario Hydro does not want to expose the electricity users of Ontario to unlimited prices caused by scarcity in other countries," says director of fuels John Matthew.



ydro has stated a willingness to enter
ito contracts that provide a fair return to
ie producer with adequate protection
om runaway prices. It appears that
ydro is reaching agreements on long-
rm uranium supply that meet this test.

"Successful exploration is essential if
opes for the domestic nuclear power
rogram are to be realized," says Mr.
atthew. "It is urgent that ways be found
to encourage increased uranium explora-
tion activity in Canada, which is
currently at a level insufficient for the
need."

For its part, Hydro has discussed provision of support for uranium exploration with a number of companies. Mr. Matthew said that he expects one or more agreements to be concluded in the near future.

"The money to be committed by Hydro is only a drop in the bucket compared to what is going to be required for exploration in Canada," says Mr. Matthew.

He said that by the mid 1980s all known Canadian reserves will have been committed to currently contemplated export contracts or set aside for domestic reactors now being built or planned.

"On the surface the reserves may appear to be ample, but this is not the key to the problem. The key is production capacity and the problem is pressing."

The director of fuels says production capability which can realistically be based on current known reserves may be inadequate to meet both domestic and export demands by about 1988 and insufficient to support even domestic requirements shortly thereafter.

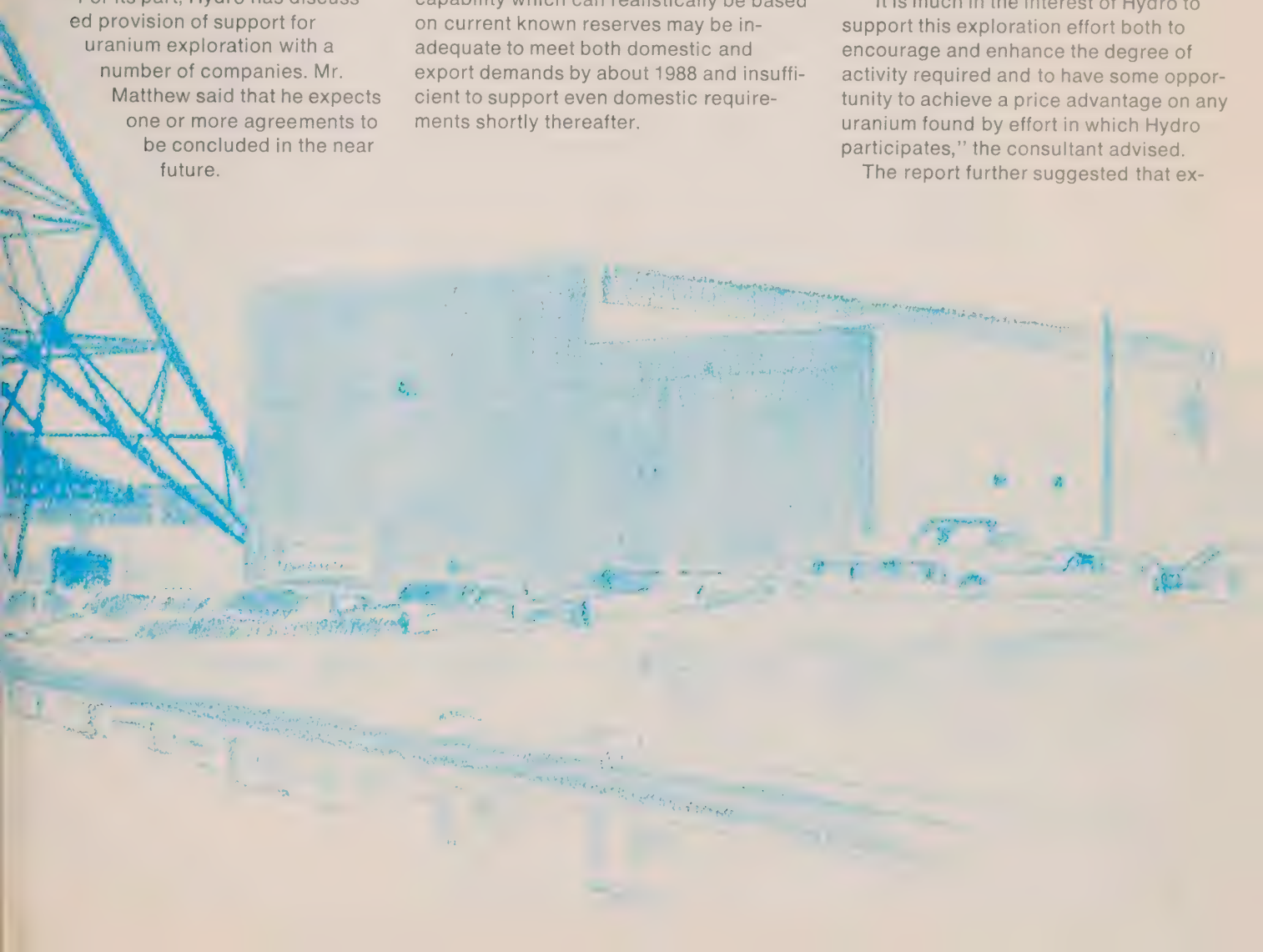
"Allowing 10 years to prove up an indicated reserve and bring it into production, new finds are needed right now if this shortfall is to be averted."

The exploration program began after a report was received in May, 1974, from Toronto consultant David S. Robertson.

Dr. Robertson wrote: "It is difficult to suggest that any particular dollar amount is proper for exploration. In view of the very large amounts Hydro will be spending to acquire uranium raw materials, in excess of $100 million per year by 1985, very large amounts could be justified.

"It is much in the interest of Hydro to support this exploration effort both to encourage and enhance the degree of activity required and to have some opportunity to achieve a price advantage on any uranium found by effort in which Hydro participates," the consultant advised.

The report further suggested that ex-



ploration not be limited to just Ontario but should include other parts of Canada as well.

Hydro's concern is shared by others in the industry and by the government as well.

William Gilchrist, formerly of crown-owned Eldorado Nuclear, which operates a mine at Beaverlodge in northern Saskatchewan, recently called on utilities to become involved in uranium exploration, development and production. And in Ottawa at this year's Canadian Nuclear Association convention, a federal government spokesman warned of possible intervention if utilities and mining companies don't get together.

G.M. MacNabb, deputy minister of Energy, Mines and Resources, said that domestic reactors committed for construction or now in operation will require 29,500 tons of U_3O_8 in order to meet the 15-year fuel requirement. He predicted that the domestic demand will grow in 10 years and that by 1985 more than 92,000 tons of U_3O_8 will be needed to meet the requirement.

Uranium exploration is on the upswing. Carson Brown, chief of mines information with the Ontario Ministry of Natural Resources, says there is a fair bit of prospecting going on now in Ontario although since companies are not obligated to specify what they are seeking it is difficult to speculate that uranium is causing the resurgence of activity. But from the number of leases being applied for in the Elliot Lake areas it is reasonable to assume that uranium is the target in that area, he said.

Mr. Brown said that in 1968, at the time of the second claims staking rush at Elliot Lake, a number of companies took out permits.

"Now they are applying for leases on the land so that development work can begin."

The first uranium rush at Elliot Lake came in 1953 and 1954. The following year, as mines developed, the community came into being. Since then, the ebbs and flows of Elliot Lake's population have followed the fortunes of uranium mining. At its peak, 25,000 people lived in the community, 19 miles up Highway 108 from the North Channel of Lake Huron, roughly half way between Sudbury and Sault Ste. Marie. That was in 1960, and over the next six years, when the demand for uranium dropped, the population declined to 6,500. At present, 9,500 people live in the area, and the population seems destined to increase again due to increasing demand for uranium, which is predicted to double every five years.

Rio Algom and Denison Mines have started new housing projects at Elliot Lake in preparation for increased mining activity on their properties in response to this demand, which is rising faster than for any other mineral.

The Elliot Lake reserves are the largest in Canada, and both Rio and Denison plan major expansion programs geared to both domestic and world markets.

Spokesmen for the mining companies say that hiring miners is becoming somewhat of a problem. However, unlike Beaverlodge in Saskatchewan, where access is confined to air, barge or winter road, the Elliot Lake properties of both Rio and Denison are not isolated, making them more attractive to potential workers. Rio and Denison are working together to handle the recruiting programs.

Other companies are bringing new mines into production. Consolidated Canadian Faraday at Bancroft, which is 48 per cent owned by Madawaska Mines Ltd., expects to bring a small mine back into production by August of 1976, and Hydro may purchase part of the mine's output.

Gulf Minerals, which owns property at Rabbit Lake, Saskatchewan, plans to start deliveries to Hydro in 1980 under terms of a contract negotiated in 1974. The crown-owned Eldorado Mine at Beaverlodge is also being expanded and Hydro expects to get some of its uranium from there as well as from a mine at Cluff Lake, Saskatchewan, which is being constructed by AMOK, a French-owned company.

The Saskatchewan Mining Association says uranium has caused a lot of excitement in that province recently. One current centre of activity is near Sandfly Lake, about 50 miles from Lac La Ronge, 300 miles northwest of Saskatoon. Among companies working in that province now are Noranda Mines Limited, Brascan Resources, Mark V Limited, Husky Oil, Anglo-Bomarc Mines and Saskatchewan Minerals Corporation.

In 1959, there were 19 uranium producers in Canada and production amounted to 16,000 tons. Then the demand fell off and many mines were shut down. Today there are only three producers, Eldorado Rio Algom and Denison. Gulf is about to begin and the Faraday project at Bancrof will be operational a year from now.

It is predicted by senior federal govern ment officials that the total production in Canada this year will be 6,100 tons compared with 4,442 in 1974. It is expected to reach close to the 1959 level of 16,000 tor by 1985.

There is no doubt, say those involved, that the impetus to the resurgence of activity has come from the success of nuclear generating stations here and abroad, coupled with the dwindling reserves and high cost of fossil fuels around the world.

Experts everywhere contend that nuclear power has to be developed to provide future energy requirements. Hydr has adopted this policy with its expansior program. The effort has brought with it a need for the mining industry to expand an provide the resources necessary to carry it out. □

Probing the depths



Bob Fleming sports the kind of a suntan that would be the envy of most south seas vacationers.

That he does is little wonder, for he spends most of his time outdoors, on the water — or in it.

But the tan becomes obscured when he dons his scarlet wetsuit and slips over the side of a 21-foot aluminum boat and into the choppy waters of Lake Huron, about a quarter-mile offshore from Douglas Point.

The craft is equipped with all the latest in underwater research equipment — from depth sounder to thermometers for gauging water temperatures.

Around the same time that Bob enters Lake Huron, a three-man boat crew sets a giant trap net in Lake Ontario, about 50 yards off the Pickering shoreline. Or Burt Worth looks on as two summer students pitch long cone-shaped nets — they look like a bleached airfield windsock — into the swirling waters of the Pickering nuclear power station discharge channel.

About 20 miles downlake, Laurence Moore scrapes algae samples from the rocks near the site of a proposed nuclear station in Darlington township, about two miles west of Bowmanville.

Further east, Harold Balesic is using a vertical echo sounder and horizontal scanning sonar unit to track fish off the shoreline at Bath, near Kingston, where the oil-fired Lennox generating station is located.

These aren't just a bunch of guys out for a good time basking in the summer sunshine, nor are they a group of hobbyist scuba divers.

They're professionals in aquatic ecology who form the nucleus of the field staff of a recently-created aquatic biology section in Ontario Hydro's Research division.

They aren't fishing for sport — or for pleasure either.

They're fishing for answers.

Hydro wants to know what effects, if any, its thermal generating stations have on the environment of the lakes on which they're situated.

Water covers about 70 per cent of the earth's surface in the oceans, lakes, rivers and glaciers.

The world's lakes, with a few saltwater exceptions, contain most of the available fresh water in existence — about 30,000 cubic miles of it. And if it were possible to pool all the fresh water flowing in all the rivers of the world, the lake formed would be a little smaller than Lake Ontario.

Close to one-fifth of the world's fresh water supply is found in the Great Lakes, hence Hydro's concern for the quality of water in them. For it's along these shorelines that the utility has established its network of thermal-electric, both fossil-fuelled and nuclear, generating stations.

"There's a growing awareness," says Gian Vascotto, a youthful aquatic ecologist who heads the new section, "that water resources on this earth — especially fresh water — is a finite resource.

"And because it is, it should be treasured as an extremely precious resource."

Mr. Vascotto explains that researchers are probing the depths around Hydro's stations on the Great Lakes to determine their effect on the in-shore waters.

Their main concern, he points out, is the once-through cooling process and the effect it has on the aquatic environment through discharging warm water into the lakes.

(Vast quantities of water are extracted from the lakes to convert steam into water in the stations' condensers. It is returned to the lakes slightly warmer than when it was extracted. Water used in the steam cycle is used over and over again in a closed system and seldom needs replenishing.)

Lake studies, both pre-operational and post-operational, are many-faceted, says Mr. Vascotto. However, he adds, one of the largest tasks facing site survey crews at the Lennox, Pickering and Bruce plants for the time being is cataloguing the species — both animal and plant — that are present.

These include everything from phytoplankton (algae suspended in the water column) to fish of varied species. In

Species taken from the lakes are weighed, measured, tagged, then returned to their natural habitat, as Ontario Hydro researchers attempt to determine the movements of fish in the area of thermal plants dotting the Great Lakes shorelines.



between are zooplankton (microscopic animals suspended in the water column) periphyton (attached algae on rocks), an benthos (larger animals which live aroun the rocks such as fresh water shrimp, worms and insect larvae).

All of these findings, Mr. Vascotto points out, form part of a complex food web, the top of which is occupied by fish.

"By studying these phenomena, we ca tell the type of environment that existed before the station started up — and just how polluted that particular stretch of water was before any warm water effluen was fed into the lake.

"We're also able to determine what species of fish survive in a particular locale and eventually gauge how many pounds of desirable species can be produced in the area of Hydro's stations.

"In the post-operational phase, we do essentially the same type of study in an effort to determine what changes have taken place on the aquatic environment with the discharging of warm water effluent into the lake.

"But," he adds. "if the pre-operational phase is carried out properly, it will allow us to predict what changes are likely to take place due to the operation of a plant in the area."

What does this research involve?

For Bob Fleming and his two assistants it involves about 80 per cent of their time from April to November, either on or in th water. The remaining 20 per cent is spen in a trailer that doubles as a partial laboratory preparing samples they've taken from the lake for analysis at Hydro's new aquatic biology laboratory, complete wit fish-holding facilities.

"Measure and monitor," are the words Mr. Fleming uses to describe what he an his crew are doing around the Bruce com plex. He says the survey team is in the area, probably for about five years, to gauge and monitor the aquatic environment of Lake Huron in the vicinity of the stations.

"We want to know what's here, and the changes the lake's undergoing — both naturally and as a result of Hydro opera-

Samples of attached algae (top) and bottom fauna (centre) taken from the Great Lakes in the vicinity of Ontario Hydro's thermal plants are prepared for shipment to the new aquatic biology laboratory in Etobicoke. At present, on-site labs are housed in trailers.

ons. We're studying everything from
icroscopic organisms to terminal
redators," he says.

While the researchers are maintaining
continuing watch on the food chain in
e lake which leads to fish production,
ey're also keeping a constant vigil on
ther aspects of lake ecology, such as
ater quality.

And they're finding plenty. For example,
complete cycle on the water takes about
month and includes everything from
tting trap nets to determine what
ecies of fish are native to the area, from
lacing two-inch-square frosted glass
lates on the lake's bottom to sample the
eriphyton and foot-square wire cages
ntaining rocks to collect invertebrates
hich inhabit the lake bottom.

In the nets, they're likely to find anything
om smallmouth bass, to rainbow trout,
rthern pike and yellow perch to such
xotic species as wild goldfish, sheeps-
ead and long-nosed gar — a fish that
ates back to prehistoric times.

The fish are measured, weighed, tagged
nd a scale sample taken before they're
leased back into the lake so that re-
earchers can track their migratory paths.
cale or fin sampling aids in determining
e age of fish and permits biologists to
etermine its growth rate at each year of
s life.

Collecting bottom fauna samples isn't
st a matter of hauling up the lines
tached to the rock cages. It's done by
e crews diving to the lake bottom to
ace the cages in fine mesh bags for
trieval. Indeed, scuba diving's fast
coming a prerequisite for men like
b Fleming.

Bill Dunstall, biologist in charge of
tting up site studies, says what crews
e doing is collecting "baseline data."
e program around the Lennox station is
mewhat more intensive because it is in
e Bay of Quinte area. The bay, he points
t, is a comparably small semi-enclosed
dy of water which may or may not be
re affected by an outflow of warm water
n large open stretches of lake.

Around the site of the proposed Darlington nuclear station, he says, periphyton, particularly cladophora, is a problem — and Hydro has yet to turn the first sod. In a one-year study there, the researchers hope to determine fish spawning areas and the cause of the algae problem.

Present plans call for the diverting of the discharge water in a westerly direction to create a mile-long warm water beach for bathers.

"An increase in the number of swimming days in a year is a significant step," says Mr. Dunstall. "However, all bathers hate algae and we hope to learn whether warm water being discharged into a large body of water encourages or discourages its growth."

Preliminary observations show that cladophora is already abundant in the area. So much so that rock samples from half-a-dozen quarries are being tested to determine whether algae show any preferences among different types of rock. If so, Mr. Dunstall says, that's the kind that may be used for fill to create islands to divert the warm water effluent along the Darlington shoreline.

Over in Lake Erie, three university students — all of them female — spent the summer gaining practical experience through the provincial government's Experience '75 program, doing essentially the same thing off the shoreline of Hydro's Nanticoke generating station.

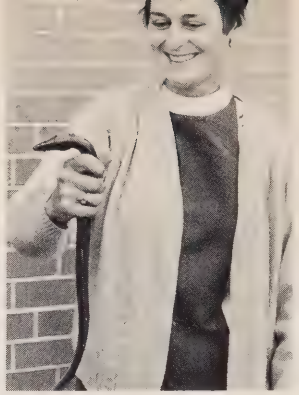
The trio says one of the most interesting of the five trap nets they checked twice a week throughout the summer was the one they set in the thermal plume from the station.

While fish were tagged and released just as they were everywhere, the girls noticed an abundance of cladophora attached to the nets.

Project Nanticoke director Geza Teleki says he can't "completely diagnose" the high occurrence of cladophora, but it may be a result of warm water and the currents increasing the optimum growth period of the algae.

The Nanticoke research is a joint venture between Hydro, Stelco and Texaco.

Slippery Problem



Among the chief concerns that face the aquatic biology people are the possible effect on fish spawning areas and the control of unwanted vegetation around the station intakes.

In their investigations, Mr. Dunstall says, no one has been surprised at the nature of the various species found so far at all sites, but at the large numbers of fish that exist. For example, smallmouth bass and brown bullheads (more commonly known as mudcat) abound in the Pickering plant discharge channel.

The on-site program is designed to determine if there is a biological change occurring in the area of a thermal plant, what that change is, and whether it's at one level of the food chain or if it affects the entire web.

Researchers aren't so much concerned with what species of aquatic fauna appear through the operation of a plant — but what species disappear.

In the meantime, researchers in other parts of the world have concluded that warm water from thermal plants can — and does — increase the rate of growth of fish.

But Gian Vascotto and his colleagues haven't as yet come to any final conclusions.

Someday they will.

Regarded as a delicacy by Europeans and Asians, American eels have been bringing the small Ontario eel fishing industry 75 cents a pound on the export market.

Consumers pay up to $1.50 a pound for them.

Although they could be a small benefit to the nation's balance of payments on the world market, they're a slippery problem to handle.

However, two Ottawa area biologists, with an assist from Ontario Hydro, have come up with a solution to the eel survival problem.

They've installed an eel ladder that permits the slippery snake-like creatures of the ocean to swim up the Robert H. Saunders generating station dam on the St. Lawrence River, at Cornwall.

Unlike the unsavory sea lamprey, the American eel isn't a parasite, but an edible fish that spawns and dies in the Atlantic Ocean, near the West Indies.

They swim up the St. Lawrence in the millions during the summer months to spend their lives — about eight to twelve years — in Ontario lakes and rivers. Some fully-grown specimens are five feet long and weigh 20 pounds.

Problems facing the world eel industries were how to get them over dams — the Saunders one is 90 feet high — and how to tag them to learn more about their movements.

European biologists have felt that both problems were insurmountable, but Dr. Vadim Vladykov of the University of Ottawa and Russ Whitfield, a provincial natural resources biologist from Kemptville, have mastered them.

Mr. Whitfield developed the ladder and since eels can't be tagged through the back like fish, Dr. Vladykov invented a small jaw tag which he made out of non-abrasive piano wire. To control an eel for tagging, Dr. Vladykov uses a chemical which briefly immobilizes it.

The idea of getting eels to swim up the 90 feet to the top of the Saunders dam was a first for the industry. The ladder is a series of long open-topped wooden troughs filled with fresh willow bows. Each step is angled at 12 degrees and the eels struggle to the top in switchback stages.

Before the ladder was installed, the station's tailrace was full of eels seeking a way to overcome the dam. In fact, there were so many of them you could almost walk on them, says Peter Liew, a University of Ottawa student who worked during the summer tagging the creatures. This past summer, more than a million eels climbed the ladder.

This could mean a big industry for Ontario, but Mr. Whitfield says, "the only trouble is that eels have to be exported to Europe, processed, sent back, and sold in the gourmet section of food stores as smoked eel."

Perhaps someone with an excess of charcoal, and a little initiative could corner the eel smoking market in Ontario. □



OMEA district roundup

Hydro implements austerity program to meet directive

To meet a provincial government directive to cut $1 billion off its capital expansion program and shave its administration costs by 10 per cent, Ontario Hydro has implemented a stringent program of austerity, says chairman Robert B. Taylor.

Speaking at the fall round of OMEA district annual meetings, Mr. Taylor said the government's requirements won't be met without impact.

"Some services now provided will have to be cut back, some maintenance will have to be deferred, but we will endeavor to sort out the priorities so that Hydro's traditionally high level of service in all essential areas will be maintained," Mr. Taylor said.

However, Mr. Taylor pointed out, one fact that some people seem to overlook is that changes in the capital expansion program have little, if any, effect on the level of Hydro's 1976 rates.

"The cost of new plants is not reflected in the cost of power until they come into service, other than through the impact on the system expansion charge," Mr. Taylor said.

Mr. Taylor said that in accepting the government's directive to cut $1 billion from the capital program, the Hydro board resolved that a revised generation program would be approved in principle.

The new program invoked a six-month deferment of in-service dates for the Bruce B nuclear power station and all subsequent generating stations, and a reduction in capital requirements to 1985 estimated at approximately $1.2 billion.

Explaining the effect of the revised program, Mr. Taylor said, "for 1983, the risk of failing to have sufficient generating capacity to meet the peak load could be more than 10 times the customary criterion. Deferment of nuclear plants will also increase Hydro's dependency on fossil fuels, the reliability of supply of which is already a matter of serious concern."

Regarding the directive to cut administrative costs by 10 per cent, the Hydro board decided the 1976 work program budget would be reduced by $30 million.

This reduction, Mr. Taylor pointed out, more than satisfies the directive and avoids the problem of defining administrative costs — a more difficult one for Hydro than for government departments.

"Immediately following the mini-budget, we announced a 60-day freeze in the hiring of staff in order to give us time to evaluate our position. Finally Hydro decided the most effective and direct approach would be to reduce total costs in 1976 by an arbitrary $30 million. All 1976 budgets are being re-examined with a view to meeting this objective," Mr. Taylor said.

(The 60-day hiring freeze has since been extended.)

Mr. Taylor added that an amount of $30 million in anyone's terms is a substantial sum, and a cut of that magnitude will call for stringent measures and reassessment of priorities right across the whole organization.

"But in the perspective of the total cost facing us in 1976, a $30 million reduction is small, and only a portion of it will affect 1976 bulk power rates anyway. In fact, when we looked at the effect, in conjunction with all the other changes including a lower load forecast, reduced export sales, revised interest rates, revised foreign exchange rates, lower escalation and the resulting lower system expansion charge, our required increase for municipalities worked out to 30.2 per cent."

(Hydro originally asked the Ontario Energy Board for an average rate increase of 29.7 per cent. That request was subsequently cut to 25 per cent for the

municipalities and 25.2 per cent for direct industrial customers).

"To meet the government's expectations of a significant reduction in Hydro's rate proposals for 1976, the Hydro board decided to defer the collection of deficits for one year and to arbitrarily cut in half the system expansion charge for 1976," Mr. Taylor said.

He attributed the increase in total bulk power cost from 1975 to 1976 mainly to the increasing costs for fuel. He said that at least 60 per cent of that increase is accounted for by fuel costs and the increases in debt retirement and system expansion, together constitute only about 5 per cent of the proposed total increase for 1976.

Mr. Taylor said the original proposal for a 29.7 per cent increase meant an additional cost of about $3 a month — or 10 cents a day — to the average residential customer.

"We were well aware, however, that it would be the 30 per cent — not the 10 cents a day — that would grip everyone's attention. And our expectations weren't disappointed," Mr. Taylor said.

Putting the rate increase proposal into perspective, Mr. Taylor pointed out:

- After the proposed increase, the average Ontario family will spend in one week on electricity only two-thirds of what it spends on cigarettes and only a bit more than half what it spends on alcohol.
- Over the past 10 years, the price of electricity has risen only half as fast as the price of milk, two-thirds as fast as the price of butter and only one-third as fast as the price of bread and chicken.
- In 1965 the average Ontarian to pay for all the electricity his family would use in a week in 1975 (which is half as much again as he used in 1965) would have to to work 60 minutes. In 1976 he will have to work only 47 minutes. This represents a real price decline as compared to the prices of other things of more than 20 per cent.
- The average residential bill in Toronto in 1976 (after the increase) will be about $19.50 a month.

McKeough quote in mini-budget 'shocks' Cousins

Government "fiddling" in the business of electrical distribution will lead to higher prices, problems of brownouts, blackouts, and inferior service — or worse still — no service at all, says Alan B. Cousins, president of the Ontario Municipal Electric Association.

Speaking at the fall round of OMEA district annual meetings, Mr. Cousins said, "it's an odd fact, but a true one, that while this is happening, the government's articulated concern, expressed through Task Force Hydro, is to save the system, to improve the capability of Ontario Hydro to serve the population of the province."

He lashed out at Provincial Treasurer Darcy McKeough's statement that he was "appalled" at the 29 per cent rate increase originally asked for by Ontario Hydro, when he introduced the government's mini-budget.

Mr. Cousins said as the province's first minister of energy, Mr. McKeough had a close working relationship with Hydro and was "well informed by the rising costs of Hydro's expansion program and the need for such a program. In fact, he was probably the chief instrument in getting Cabinet approval in principal for Hydro's long-range plans to 1982.

"And that's why I'm shocked. I'm shocked because he's appalled," Mr. Cousins said.

Mr. Cousins added: "And here we sit — the OMEA and eight other intervenors — having spent considerable hours in front of the Energy Board working on a submission of extreme detail, the four volumes presented by Hydro, at God knows what cost — and with a flick of the tongue — we get $1 billion off the long-run investment program and 10 per cent shaved off the administration costs."

He claimed there are as many ways being suggested for Ontario Hydro to bring down its rates as there are organizations and groups in the province

"Certainly I'm not suggesting for a moment that we should close our minds practical solutions to keeping costs dow nor should we turn our minds off when there are reasonable suggestions made that might lead to new ground.

"One of the favorite proposals being made today is a peak pricing policy, which portends to provide cheap power i it is used at off-peak hours. However, there are problems to this, one of course being the cost of meters that would have to be installed in every house, estimated at a cost of $100 an installation. It is most unlikely that any utility would be able to raise the debenture required to make this kind of installation. Further, it's most unlikely that the savings would warrant the expense.

"Perhaps what would be more helpful would be a more realistic attitude on the part of the public and of our political leaders," Mr. Cousins said.

Mr. Cousins said there was no question that the gigantic sums Hydro's asking for must give sensible people reason to pause and to demand an independent an critical examination of the factors involved: "That's precisely what's being attempted in front of the energy board. Scarcely any facet of inflation except taxation would be as universally felt as power prices.

"But, conversely, the impact of increases in the cost of power may not be anywhere near as great as many people believe."

He suggested that, as commissioners, OMEA members have a real job to do: "It's no longer enough to content yoursel with local matters — you are most assuredly involved on a broader basis. You have already been turned around by Task Force Hydro. You can't help but be further affected by the Solandt Commission recommendations, the Parkway Belt West Committee recommendations, the Porter Commission studies, the restruc-

ring of utilities, the Ontario Energy
oard's annual reviews and the machina-
ns of the government.
"So before we start carping, let's be
re we have some facts to work with. We
ve to know what these various programs
e about, what they will cost — in time as
ll as money — what benefits they may
nder, and to whom.
"We must be sure that Hydro's plans for
pansion are necessary and valid and
t costs are reasonable in the circum-
nces and then we have to stand up and
counted," Mr. Cousins urged.

Government intervention ot interference'

vernment, under public pressure, will
obably continue to be involved in the
ctrical utility business, says Bruce
ntice, president of the Association of
nicipal Electrical Utilities.
Speaking at the fall round of OMEA
trict meetings, Mr. Prentice told com-
ssioners in northwestern, northeastern,
ntral and southern Ontario there has
en a continuing concern to keep politics
of Hydro in Ontario.
"I suspect," he said, "the real concern
been to keep political interference out
Hydro. In my view this has been by-and-
ge a successful effort.
However, I think we must be careful
l differentiate between government
ion and political interference."
Mr. Prentice said that because citizens
e become confused, frustrated and
ry, they have demanded action from
r governments.
Governments in turn have acted — or
cted — with new laws, investigations,
rds of inquiry and legislative amend-
ments which have had a profound effect on and caused substantial changes in the way business is done and on the techniques of business management.

"This is not political interference in the old sense — but rather government intervention on a new and far greater scale.

"Our own industry and its management has been affected perhaps more than most," Mr. Prentice said.

He added that under public pressure from all sides, the government will probably continue to be involved in the electrical supply business.

"In this situation, any government under pressure, with the best of intentions can make serious mistakes when they are deficient in expertise.

"We know that they'll be inundated with advice in the editorial columns and from pressure groups — advice which is not usually backed by facts as much as by emotion.

"The AMEU," he said, "both collectively and individually has a responsibility to the people of Ontario to give them the benefit of our knowledge and experience in matters affecting the electrical distribution industry.

"The question of how we do it is a problem. In my view, the manager of a public utility must not take to the public platform. But he must keep himself knowledgeable and informed, not just about his own immediate problems in his own bailiwick — but also in the broader sense in those areas where decisions being made which may affect the industry as a whole.

"Commissioners have their own major responsibilities to insist their manager be up to date and knowledgeable and that he keep them informed. They must accept the responsibility of applying their own judgment to the facts and opinions they have received and develop their own course of action.

"In my opinion, if we are to provide the best service to our customers in a manner acceptable to them, we must, as individuals and as associations, do the job we are hired or elected to do in a fully responsible manner.

"The fact that most of the problems facing electrical utilities stem from changes imposed by external forces should not throw us. Solving problems in our business is our job," Mr. Prentice said.

Restructuring won't be forced, delegates advised

The provincial steering committee for the restructuring of municipal electrical utilities has no intention of forcing restructuring on anyone, delegates to the fall round of Ontario Municipal Electric Association district annual meetings have been told.

Spokesmen for the committee, including chairman S. A. Baldwin and vice-chairmen A. G. Stacey and L. E. Cooks, said that at least four municipal utility restructuring studies should be completed by the end of 1976.

They pointed out there are 96 municipal utilities plus Ontario Hydro's service areas in the 12 regional municipalities that have been established in the province.

About half of the affected utilities — 53 to be exact — are expected to be involved in restructuring before the end of the year. During the coming year the steering committee hopes to have local study teams established in all areas of the province where a desire for restructuring has been indicated.

By the end of next year the committee expects to have prepared transitional and start-up programs for new electrical utilities in at least three regions, and is aiming at a target that will see at least two regional municipalities with new electrical utilities in operation by January, 1977. Amendments to existing legislation will be required.

Under terms of the guidelines set down by Energy Minister Dennis Timbrell in amending the original Hogg report, restructuring will be carried out only when requested by local authorities.

The spokesmen said it's too early to tell what proportion of Ontario Hydro staff employed in the area offices within a regional municipality will be directly affected by restructuring.

However, they said fair treatment of staff required to transfer from one utility to another is one of the main objectives of the local study groups and the steering committee.

Restructuring is designed to minimize the differences in service policies in a region and will aid in overcoming confusion by customers who cannot identify service boundaries with political and municipal boundaries.

The spokesmen said restructuring will also help eliminate disparities in rates within a region or areas of a region. The major aim is to ensure that any restructuring improves services and serves the interests of citizens and the community.

Local study teams have been set up in Waterloo, Peel, York, Niagara, Hamilton-Wentworth, Haldimand-Norfolk, Sudbury region and Oxford County.

District 2

Financial policy has dual purpose

Ontario Hydro's financial policy was designed with a dual purpose — to define the amount of funds that need to be raised through today's power rates to reduce future borrowing, and to maintain financial viability in the eyes of investors, says its vice-president—Resources, Milan Nastich.

Speaking to the annual meeting of OMEA District 2, in Muskoka, Mr. Nastich said this was the main financial issue before the Ontario Energy Board.

Mr. Nastich pointed out that Hydro has only two sources of funds available to it: revenue and borrowing.

Included in Hydro's revenues, Mr. Nastich said, are funds for debt retirement and system expansion which are designed to repay debt and to help finance the system expansion program.

He said that during 1975, Hydro expected to borrow $1.5 billion and this is expected to increase substantially in future years.

"Ontario Hydro," Mr. Nastich said, "is a capital-intensive organization which must invest large sums of money for a long term and on a continuing basis to meet expected future power needs.

"Capital investment can be financed either from revenues or by borrowing. However, a capital program of the magnitude of Hydro's simply could not be completely financed out of revenues, therefore Hydro must make use of the debt market.

"But to make extensive and continuing use of the debt market, Hydro must preserve its financial health and credit standing. Otherwise, investors will place their money elsewhere.

"In practice, protection of Hydro's long-term financial health is achieved by including in the annual revenue requirements a specified appropriation of funds to help finance the capital program. Capital borrowings are thereby reduced and investors are given an assurance that the current power customers are prepared to assume a part of the burden of providing the power needs of the future," Mr. Nastich said.

He added that another important reason for including a system expansion charge in annual revenues is the impending shortage of capital.

"Expanded requirements for capital," he said, "are apparent throughout the world.

"For Canada, the federal Energy, Mines and Resources Department estimates that expenditures on energy resources will exceed $100 billion over the next decad

"That represents about 5½ per cent o the total gross national expenditure. By comparison, the average proportion of energy capital to the GNE was 3.15 per cent in the nine years from 1961 to 1970, Mr. Nastich said.

He pointed out that Hydro's studies of capital markets have shown that a signif cantly greater proportion of its future borrowings will be outside of Canada.

Between 1970 and 1974, 61 per cent o Hydro's capital requirements was raisec in Canada, but between 1975 and 1982, only 40 per cent of Hydro's needs can be met in Canada.

And, Mr. Nastich said, a greater propc tion of Hydro's future borrowing will be in short and intermediate-term bond markets.

Between 1970 and 1974, 82 per cent o Hydro's borrowing was done in long-ter bond markets.

"Our projections now indicate that on 58 per cent can be raised in the long-ter market between 1975 and 1982," he saic

Energy hearing costs attacked

The adversary process at hearings befo the Ontario Energy Board is "running ho wild," and legal expenses are getting ou of all control," says Dr. R. H. Hay.

Speaking to delegates at the annual meeting of District 2 of the OMEA, Dr. Ha former chairman of the provincial assoc tion's power costing committee and a member of the Ontario Hydro board of directors, said legal expenses are out of all control for the benefit anyone could hope to derive from them.

"AMPCO (the Association of Major Power Consumers of Ontario)," he said, "is spending a tremendous amount of money — something like 20 cents a kilo-

att assessment to its members — to pay gal expenses for its intervention at the earings. International Nickel is a member that group and is intervening itself. The ssociation of Municipalities of Ontario is aking a real spectacle before the board.

"The OMEA is represented properly as intervenor on a modest scale, but the MO isn't quite as modest — in fact, it's e of the adversaries that's completely t of control and is increasing expenses t only to Ontario Hydro, but is causing necessary costs to be passed on to its stomers," Dr. Hay charged.

"But," he said, "what really worries me what will happen next year.

"Will the energy board go beyond its quiry into the wholesale rates for power d into the retail rates charged by the unicipal utilities?

"And what worries me most," Dr. Hay id, "is what's happening in the U.S. ming here?"

U.S. utilities, which have cut back con-ruction programs because of financial oblems, fear power shortages will result nen the present recession ends.

istrict 3

Austerity forces 400,000 cutback

ere austerity is upon Hydro, says G. E. tterson, Ontario Hydro's Northwestern ion manager, and with inflation and nomic pressure continuing apace, ings could get worse before they get ter."

Speaking to delegates attending the ual meeting of District 3 of the OMEA chreiber, Mr. Patterson said that in the thwest Hydro is going to have to cut 0,000 from its 1976 budget.

"With all the talk about millions and billions, that may not seem like much, but it's going to call for stringent measures and a reassessment of priorities and programs across the region," he said.

And he added that Hydro is in "complex times where there are few simple solutions on the one hand and too many people offering simple solutions without knowing, admitting or caring about the consequences of those simple solutions on the other hand.

"We at Ontario Hydro are trying to get the public to realize the choices they have and the consequences of their choices through processes like the Ontario Energy Board, Porter Commission and the like.

"Local Hydro commissioners have a great responsibility to their customers and electors to understand and to present these alternatives clearly and openly," Mr. Patterson said.

District 6

Call for unity and for help

Two calls went out at the OMEA District 6 annual meeting — one for unity by its retiring president and the other for help by a representative of the Ontario Electric League.

W. A. Smith, of Waterloo, retiring president of the district, said last December's municipal elections "pointed out the apathy of the electorate in many areas to Hydro commissions — there were many acclamations.

"It seems some of this apathy has spilled over to the commissions themselves. That became evident when our district directors, by two letters, requested suggested names for people to serve on the board and only two replies were received.

"It's up to us," he said, "to strengthen District 6 in the year ahead and thereby help to strengthen the provincial association. Participation and involvement are the key words," Mr. Smith said.

He charged that a stronger bond between commissions and councils in the district might have prevented the Association of Municipalities of Ontario from duplicating the OMEA efforts at hearings before the Ontario Energy Board into Ontario Hydro's application for a rate increase.

"That would have saved the ratepayers many thousands of dollars," Mr. Smith said.

"Let us start this year by putting our houses in order, strengthening our OMEA bond at the district and provincial level and by relating our OMEA-Hydro message to our councils and the people we serve," he urged.

D. A. Beattie, of the OEL, said the League is prepared to set up training courses in conjunction with several colleges of applied arts and technology to teach either utility staffs or municipal building inspectors to check insulation levels in electrically heated homes to ensure they are up to standard.

"Ontario Hydro can no longer promote the sale of electricity and is no longer in the selling game," Mr. Beattie said. "With the transfer of the sales staff to other duties, most of the OEL representatives are gone and there is no longer a large field staff to assist the league.

"The community colleges appear to be the best route for this training, which is being instigated by the OEL. Hydro has offered the services of its technical services people — but they are few in number.

"This is where you in the utilities can help the OEL to help you. We need resource people who can provide their technical knowhow as trainers for the colleges,' Mr. Beattie said.

He added the OEL hopes to start an intensive program for all types of courses in 1976 through its local chapters.

District 9

Northern needs helped by South

Ontario Hydro's Northeastern region manager, L. A. Coles, has refuted statements made in the media that the north is "being raped for energy by the south."

In a paper prepared for delivery at the OMEA District 9 annual meeting in Timmins, Mr. Coles said the media in the north has charged that vast amounts of cheap hydro-electric generation was being exported from northeastern to southern Ontario.

"There are times during each year, and even times during individual days, when more energy than is required to meet the demands of the northeast can be produced right here in this region," he said.

"There are more times, however, when we cannot produce sufficient to meet our load and have to depend on the tie-lines with southern Ontario to make up the deficit".

Mr. Coles pointed out that over the last 25 years there have been 13 years with a net import from the south and 12 years when a net export occurred to the south.

In 1974, he said, net imports into Northeastern region were 725,880,000 kilowatt-hours, "so if we didn't have the tie-lines we would have done a lot of load-shedding, conservation, or something."

From the first of this year until the end of July, he added, Northeastern region has required a total import of almost 300 million kilowatt-hours. "That is equivalent to being short 60,000 kilowatts for 24 hours a day for the whole seven months — we were short of the energy equivalent to that used by a city somewhat larger than North Bay.

"The amount we will be short depends on the size of the load (power demands) in the region, the availability of water, and the availability of the region's generating units. Our peak load in 1974 was 1,280 MW in December. On April 15 this year, we had to import the equivalent of 785 MW for the total 24-hour period of that day. That meant we were deficient by more than 60 per cent.

"Don't believe anyone who tells you Northeastern region is self-sufficient in electric energy. We'd be doing a lot of shivering up here if it weren't for our tie-lines to southern Ontario," Mr. Coles said.

He added that it was expected the target date of Nov. 15 would be met for taking over the supply of electricity to Moosonee and Moose Factory from the Ontario Northland Transportation Company and Northern Canada Power.

The region plans to service the area with two men — a native of the community who is a lineman with ONTC, and one of the region's trained linemen.

Mr. Coles' paper was delivered by G. E. Patterson, formerly marketing manager in Northeastern region who was recently appointed manager of Northwestern region. □

along hydro nes



nportant fuel

espite Ontario Hydro's heavy reliance on anium to meet future needs for the sup- y of electric energy to the province, coal ll remain a significant and increasingly portant fuel to the utility, says its vice- esident — Resources, Milan Nastich.

Mr. Nastich told the recent Canadian nference on Coal in Vancouver that ydro's demand for western Canadian al and lignite will jump from a million ns a year in 1977 to 7.5 million tons a ar in 1981.

"Demand for electricity continues to ow, perhaps at a slower rate, and this mand will not be met solely from draulic and nuclear sources.

"Fossil fuels will be required to help fill e need for power and this means coal. l and gas are scarce, needed for other es — and are expensive," Mr. Nastich id.

While traditionally Hydro has relied on al from the Appalachian region of the S., it is seeking to diversify its sources supply by obtaining a portion of its pro- cted needs from western Canada while ntinuing and somewhat expanding the pply from the U.S., Mr. Nastich said.

He added that meeting Ontario's needs ovides the west with a long-term market, market that's not "boom or bust" and e that is likely to grow in a controlled nner.

'We believe that establishment of a sic movement of coal from western nada to the Great Lakes is not just a nefit to Ontario. It also is in the best erests of the western provinces and nada as a whole," Mr. Nastich said.

Coal will continue to play an important d expanding role in electrical genera- n in Canada provided its economic sition can be maintained.

Mr. Nastich called for the co-operation governments, producers and transpor- on companies to work out the social, nomic and technical problems that are standing in the way of completing the delivery of western coal to Ontario.

He said to bring western coal into Ontario will require development of an elaborate transportation system. Rail facilities must be upgraded, large unit trains to handle the required volume must be acquired, a storage and transfer terminal at Thunder Bay must be constructed and additional lake shipping capacity must be provided.

"In a broader context," he said, "a new trade link across Canada will come into being. Other potential markets will be opened up for metallurgical as well as thermal coal from western Canada."

A potential growth in foreign trade and dependence will be replaced by domestic growth.

"In total, all segments of the Canadian economy will be strengthened," Mr. Nastich said.

In the meantime, federal energy officials say a coal shortage is developing in Canada and likely will last at least a decade before enough new mines can be brought into production to meet growing demands.

The shortage could occur as early as next year, growing to several million tons annually until production catches up in 1985.

The predictions, the energy officials say, are based on growing demand for coal-fired generating stations and the assumption that Ontario will not be able to get increased shipments of coal from the U.S., which faces power shortages of its own.

Cutback pace slows

Electric power companies in the U.S. are continuing to cancel and postpone construction of new generating facilities to meet future demands, although at a slower pace than last year.

And nuclear plants have offered the most cancellations.

The latest electric power survey made by the Edison Electric Institute, the trade association of U.S. investor-owned electric utilities, shows five nuclear reactor units representing 7,746,000 kilowatts were cancelled in the first half of 1975.

During the same period, eight conventional power units, representing 6,040,000 kilowatts, were cancelled.

Cancellation means the removal of a proposed plant from the construction schedule by a utility, according to the Institute, or cancellation of an order for equipment.

Under this definition, there were actually seven nuclear cancellations because the supplier of two reactor units for one utility project cancelled the order on the grounds that it was planned too far in the future.

Since the Edison survey, several other utilities have cancelled or indefinitely suspended their plans to build nuclear plants.

Energy industry executives and investment market analysts offer a number of reasons for the cutbacks, which represent billions of dollars in potential investment.

Most emphasize the continuing inflationary costs of building new generating facilities, particularly nuclear plants, and the continuing reduction in customer use of electric energy since the 1973-74 Arab oil embargo.

The Edison Institute has projected a growth of 9 per cent in the peak load use of power this year, but so far peak demand has not passed the 3 per cent mark.

Westinghouse Electric Corporation, largest U.S. producer of nuclear power systems, reported recently that the reasons for cancellations and delays were "chiefly financial."

However, Westinghouse added that "the perceived low growth in electricity usage, which is a direct result of the recession, contributed to the cutback in orders."

Westinghouse, which has received four orders for nuclear power units this year, would not report on cancellations for the 1975 calendar year separately. But the company said that since January, 1974, it has received cancellations of 25 nuclear units representing 28 million kilowatts and

62 conventional power plants representing 38 million kilowatts.

Utility executives and engineers have argued that cancellations may result in inability of the utilities to provide the power that customers will demand near the end of the decade and in the 1980s.

They have asked for tax incentives and quicker regulatory action on rate increase requests to raise the capital required.

Consumer groups counter by saying that conservation since the Arab embargo has significantly changed the pattern of power use by customers.

Public misinformed

Public understanding of energy issues is being hindered by misinformation, says Energy Minister Dennis Timbrell.

Speaking to a Deep River audience, Mr. Timbrell said it's little wonder the public tends to be confused over energy questions because the Canadian and world energy scenes have changed quickly in the past few years.

"One of the main pieces of misinformation," Mr. Timbrell said, "is that Ontario Hydro is operating on the basis of a growth ethic.

"The truth is that the growth in demand for electric power is the result of increased population and increased industrial and commercial activity.

"Hydro does not create growth or live by a growth ethic. Hydro responds to the demand that is due to increased activity in the province."

Mr. Timbrell added that it is simplistic to suggest that the development of the electric power system in Ontario be arrested.

"It would mean fewer jobs, fewer housing facilities, and a general slowdown in Ontario's economy."

Critics have also charged that the government has no control over Hydro, Mr. Timbrell said.

"Nothing could be further from the truth. Hydro must obtain permission from the Ontario government for at least 25 different types of actions, including acquisitions and expropriation of lands, and construction of all major works.

"That's why Hydro's plan for the future development of the power system has been moved completely into the public domain for the benefit of total public scrutiny.

"That's why we're seeing the establishment of the royal commission inquiring into Hydro's long-range plans (the Porter Commission) and the series of public hearings that are taking place on Hydro's short-range extension plans.

"And that's why the Ontario Energy Board was ordered to inquire into the proposed Hydro rate increase," Mr. Timbrell said.

"All of these procedures," he added, "have been undertaken to ensure that the public is fully informed, and participates fully in the planning process of Ontario Hydro — the public's electric power corporation."

He pointed out that when the government ordered Hydro to cut its capital budget by $1 billion and to trim its administrative costs by 10 per cent — a level comparable to the government's directive to all its ministeries and agencies — Hydro responded by cutting $1.2 billion from its capital program and $30 million from its work program budget.

Big policy shift

A British Columbia Hydro decision to use coal to generate electricity is a major policy departure for the utility, says its chairman, David Cass-Beggs.

Mr. Cass-Beggs made the statement during the presentation of a report on the electrical generating and transmission requirements in B.C. over the next 15 years.

The report also said nuclear power will not likely be used in B.C. until 1991.

Using coal to generate electricity is major departure for B.C. Hydro, which h traditionally used water.

Mr. Cass-Beggs said every school ch in Canada is taught that B.C. is the pla where there are massive water resourc to be tapped for electrical generati "but now it makes good economic ser to use coal."

Resources Minister Bob Williams, Hydro director, said a utility commit decided against nuclear power on ec nomic grounds — the government decic against it on political grounds.

Coal for the utility's thermal plants v come from the Hat Creek deposit n Ashcroft. The deposit contains 500 milli tons of low-grade thermal coal and owned by B.C. Hydro.

Another 1,500 million tons in the ar are held in a crown reserve. Mr. Willia said the utility should be able to obt rights to those deposits.

Mr. Cass-Beggs said B.C. Hydro going into thermal generation for ec nomic reasons.

He added possible future hydro-elect projects would involve long-distan transmission and cost much more than t thermal plants.

Hydro has conducted environmen studies in the Hat Creek area, he said, a "there are no real impediments to usi the coal."

The coal will supply a two-phase th mal project. The first phase will consist four 500-MW units coming on the line b tween 1983 and 1985. In the second pha four more units generating 700 MW ea will be placed in service between 19 and 1988.

Scientists settle

Engineers and scientists who design a build Candu reactors have accepted a per cent wage increase to end a five-we

ating strike against Atomic Energy of nada Limited.

The 78 per cent vote in favor came at end of a three-hour meeting of 250 mbers of the Society of Professional gineers and Associates of AECL.

They had been locked out of their jobs five days when they defied a manage-nt order that they cease their rotating ke.

Talks between the two parties resumed er a five-week breakdown and the tlement was reached in four days.

ancer fighter

$10 million hospital instrument system being developed in Stanford, California, fight cancer with tiny nuclear explo-ns.

The key device, called a pion generator, on will begin tests with living cells and oratory animals.

f successful, pion therapy would be a jor achievement although it may take ee to five years before the treatment is ilable to patients.

The new instrument uses a stream of atomic particles, called pions, gene-ed by a high energy accelerator to nbard the cancer. Pions are the "glue" t hold protons and neutrons together in nucleus of an atom.

When pions strike living tissue they are ntually captured by nuclei in the ue's cells. But a nucleus that captures on promptly explodes.

Because the nuclear fragments pro-ed in this explosion cause such great truction, pion therapy is expected to about three times as effective in killing or cells as x-rays giving a comparable ation dose," says Dr. Malcolm Bag-w of the Stanford Medical Centre team is developing the pion generator.

ions have the advantage over x-rays, ch pass through the body, damaging lthy as well as malignant tissue.

Another advantage is that radiation released from the miniature atomic explosions in the cells enables therapists to see exactly where cell destruction is taking place.

A radiotherapist would function somewhat like a surgeon, using beams of pions as a knife and auxiliary instruments as eyes to see where he is cutting.

The new method should be particularly successful with some cancers now difficult to treat, such as cancers of the mouth, throat, brain and lung.

Stanford's team is one of four groups in the world now studying pion therapy, but it's the only one developing an instrument system that can be installed in a hospital.

Fisheries appointment



Ontario Hydro's vice-chairman, Dr. Robert J. Uffen of Kingston, has been appointed a member of the Fisheries Research Board of Canada.

Dr. Uffen's appointment, for a five-year term, was announced by Fisheries Minister Romeo Leblanc.

Garbage gas

Garbage buried in a Rolling Hills, California, hillside since the 1960s is returning an unexpected dividend in the form of usable methane gas from the world's first such recovery facility.

Los Angeles county and an experimental fuel company recently showed off the pioneer installation which draws the gas from the decomposing wastes of a huge landfill site on the Palos Verdes Peninsula and feeds it into the mains of the Southern California Gas Company.

When it reaches full production, the facility will be drawing out two million cubic feet of raw gas a day and purifying it into one million feet of consumable gas — enough for the needs of 2,500 homes.

The concept is one adaptable all over the U.S. as a modest alternative source of energy.

Since 1963 the hillside has been one of the biggest dumps in the country. Sanitation trucks emptied their daily pickups of discarded foods, newspapers, cans, trash and other refuse.

Private citizens used to throw away old furniture and other accumulations of their attics and basements. Refineries, chemical and other industrial plants were permitted to pour liquid wastes into great cavities.

The rotting and decomposing mixture over the years created gases that were leaking to the surface, causing an unpleasant odor and a potential fire hazard.

Now the gas is being put to use and a large section of the 172-acre site is being seeded for an 18-hole golf course. The wells dug 100 feet and more deep are not only invisible, but their round wooden tops are covered with astroturf so they blend into the fairways.

The NRG Nufuel Co. of Newport Beach, California, dug the wells and built the small purifying plants. It pays the county a royalty for the gas extracted and sells it to Southern California Gas on what was

described as a "competitive" economic basis compared to other fuels.

The facility became operational earlier this year. Enlargement of the operation at the one site alone in the next few years is expected to provide gas for as many as 10,000 homes.

Crisis unavoidable

Assertions that Canada and the United States have a large undiscovered potential for oil are "dangerously misleading," says a Carleton University geologist.

Writing in a recent issue of Science Forum magazine, Dr. F. K. North says the hope that several offshore areas will solve the problem of oil shortages is "almost certainly doomed to disappointment."

And he was not optimistic that oil production from the Athabasca tar sands could reach a level necessary to maintain Canadian self-sufficiency.

Dr. North argues that Canada is actually an energy-deficient country, although it has traditionally been considered "some kind of resource cornucopia."

He says Canada possesses significantly smaller energy resources than the U.S.

Dr. North adds that neither Canada nor the U.S. will be able to postpone a dramatic energy decline.

"Canada," he says, "is the only energy-deficient nation in the world that believes itself to be energy-abundant and behaves accordingly. Canada faces an unavoidable energy crisis before the end of the 1970s.

"Assertions that Canada and the outer continental shelf of the U.S. have a huge, undiscovered potential for oil are dangerously misleading. Expectations that several remote, offshore parts of our territory will solve our impending oil shortages, once exploration finds the password, are almost certainly doomed to disappointment," Dr. North says.

He predicts the level of world oil production will start to decline about 1985 — even without political interference — not half-way through the 21st century, as many otherwise pessimistic authorities maintain.

municipal briefs

Ontario Hydro's Guelph area manager, Al Avey, has been named area manager in Newmarket. He succeeds Mike Crompton who has joined the secretariat assisting the steering committee for the restructuring of municipal electrical utilities.

Niagara-on-the-Lake Hydro chairman W. Sam Jennings has lashed out at the provincial government for adding to the province's power costs by forcing Ontario Hydro to undergo a continuous series of public hearings into proposed rate increases. And he said that if the government was interested in reducing power costs in the province it could start by cutting back on the $12 million it charges Hydro in water rentals for hydro-electric generating stations.

Smithville Hydro Commissioner William Brooks has resigned to take over as the township's building inspector and bylaw enforcement officer. His appointment has been a controversial one because he is the former mayor of West Lincoln, is close to retirement age, and is expected to join a union representing the township employees.

Port Dover PUC has named Jack E. Stephenson as its Hydro manager to succeed A. Don Simpson, who is retiring. Mr. Stephenson was formerly with the A. B. Chance Co., a manufacturer of electrical equipment for utilities.

Caledonia PUC's staff is proud of the certificate hanging in the utility's office and justifiably so. It's an Electrical Utilities Safety Association of Ontario certificate of merit for having worked 14 years without a lost-time accident.

The man who dubbed Meaford the Gol Town has left town. Roy Bishop, who managed Meaford PUC for the past r years, and who was a perennial winne the OMEA's public relations award, been appointed general manager secretary-treasurer of Port Colbo Hydro. He succeeds Kenneth Lusty v has retired. Mr. Bishop was named M ford's citizen of the year in 1969.

Former Oakville PUC manager Ross La has been appointed to the Ontario Ene Board. Mr. Lamb, who left his Oakv post last January, has been working a utilities consultant since that time.

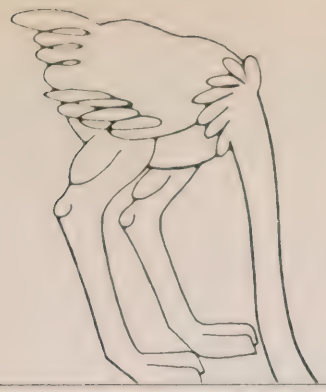
A possible strike was averted when Wi sor Utilities Commission's 250 outs workers accepted a 19 per cent wage crease over a two-year contract. The p called for a 10 per cent boost this y and 9 per cent in 1976.

Etobicoke Board of Education's maint ance workers went back to school in fall, but not the ones they're used to. T attended a series of seminars designe help the board shave close to $2 mill from its energy costs.

It was Chester Martin day in Coldwa recently when civic officials, munici politicians and just about everyone els town turned out to pay tribute to the n who has retired as the town's cle treasurer and Hydro system manager.

East York Hydro has celebrated its gol jubilee by presenting the Brewery Hal Todmorden Mills with a permanent Hy display. The exhibit consists of a roll desk, a 50-year-old telephone, vari types of pole top insulators of yestery and a light fixture once used in borough. True Davidson, former boro mayor, was the driving force behind s ting up the display.

Galt PUC's engineer for the past deca Clifton E. Ireland, has been appoin manager-secretary of the utility. He s ceeds David N. Durward, who has reti after 42 years' service.



as don wright sees it

s that time again when we must ask our aders to suffer through another good usekeeping session as we purge our lging files of mouldy tidbits accumu-ed over the year for their social signi-ance but rejected from month to month r the lack of any common element — cluding sense.

First, let's deal with this little item relat-g to the dastardly plot Hydro is alleged have hatched relative to the incinera-n of Queen's Park and all those that do thin it dwell.

Brought to light by a columnist in a ronto newspaper, the reprehensible heme is alleged to involve the use of dro's new head office structure as a litical roasting machine.

Disguised as a model of energy conser-tion and efficient office accommodation, e writer reveals, the curved glass struc-e is really a giant magnifying glass ich, when perfectly aligned with the n, is capable of focussing enough heat the legislature to zap it into oblivion. ning was said to be crucial to the ccess of the plot and this would be verned by the exact position of the sun relation to the earth at one particular tant in time. Legislative doomsday was ught to be scheduled to take place just fore the election.

That time has come and gone, of urse, and the ivy still clings unsinged to liamentary walls. Totally unfounded is way Hydro officials describe the alle-ions and there is absolutely no truth to rumor that President Gordon has fired chief astronomer.

We're all for wind power and any other thod of conserving dwindling re-rces, but sometimes it seems to us that more ardent advocates are deter-ed to keep the windmills turning by the er power of their own vociferousness.

One fanatic on the subject, from the versity of Massachusetts, is recom-nding to all who will listen a plan to erate from 5 to 10 per cent of U.S. ver requirements with the use of wind-s. And what is needed is a string of ,000 towers, each 850 feet high and carrying 30 sets of propellers, stretching in a chain from the Texas coast to the Canadian border.

Neat trick all right, but his figures may be open to question if the Canadian calculations are valid. Not one to back off from a good slide-rule duel, a professor from the University of Saskatchewan, where they know all about wind, figures that to generate all of Canada's energy needs by windmill would be enough to make your head go around. More specifically, if the whirly-gigs were 10 feet in diameter and driven by winds averaging 12 miles per hour, 900 million of them would be required. These would circumnavigate the globe 70 times and cost two trillon dollars.

We aren't about to add fuel to such a fool duel by tilting at windmills but it sure adds up to a lot of spinning reserve.

■ Always on guard and ready at the drop of a hat to defend the underdog, we feel compelled at this point to put in a good word for the electric toothbrush. Is there a conservationist anywhere who hasn't at one time or another called down the wrath of God on this humble little instrument as symbolic of our gluttonous energy society?

The latest such incident coming to our attention involves an enraged Indian chief way out in British Columbia who doesn't want to surrender his daisy fields for a generating station — "just so some Vancouverites can buy another electric toothbrush."

And yet we have it on good authority that if every man, woman and child throughout the land were to devote every minute of his life to scrubbing his teeth with an electric toothbrush, the net effect on the country's generating stations would be practically zilch. As an energy pig the toothbrush is a pretty small mouse. The real hogs are to be found in such things as poorly insulated buildings, mammoth automobiles and in wasteful practices by business and industry.

So don't get up tight just because the next door neighbor makes funny whirring sounds and flashes a dazzling smile. Maybe your car is bigger than his.

■ Whatever happened to all those advocates of a simple international language? Two unrelated items recently brought to notice seem to indicate that communications remains a problem.

The first harks back to the days of Ahmed the Damned, Sultan of Turkey, and a bit of a fox paw brought on by language difficulties. Ever fearful of assassination, the Sultan is said to have banned the use of generators in Istanbul because he confused the word dynamo with dynamite. When the docility of electricity was demonstrated to him by rubbing a cat's fur in the wrong direction he was delighted and suggested that in the future that is how it should be done — there being so many cats in Turkey.

And more recently we have the case of some English-speaking delegates running into language difficulties at an international conference on civil engineering. All were puzzled by the translation of a Russian delegate's speech which included several references to "water goats."

Careful examination of the text and consultation with other delegates revealed that a more accurate translation would have been "hydraulic rams."

■ Heard any good cracks lately? Crack listening is among the latest techniques developed by the nuclear fraternity to detect cracking damage as it occurs in the steel tubes used in reactors. These fellows have developed an instrument which can actually capture and record a crack the instant it begins to crack. More precisely, as this item points out, it enables technicians to pick out "the transition point between the incubation and propagation of cracks."

Earlier experiments leading to this sophisticated approach were much more rudimentary. They involved stationing technicians, presumably with ear trumpets or other sound-intensifying devices, within the area of the pipes. It was their job to sit all day and listen for cracks.

Predictably, we think, that approach had to be abandoned. The suspense was too great and the boys were cracking up.

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Final Issue

Hydro News 1916-1976

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The BULLETIN

Vol. I No. 1

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JULY, 1916

HYDRO ELECTRIC POWER COMMISSION OF ONTARIO

hydro news final issue

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This marks the final issue of Hydro News after 60 years of continuous publishing. The Bulletin, published from July, 1916, was renamed Hydro News in June, 1942.

hydro news, volume 63, number 1

Published by Ontario Hydro, 620 University Ave., Toronto.

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Member of Corporate Communicators Canada.
Printed in Canada.

Austerity begins at home

elt tightening is the order of the day at ydro. Budgets are being cut to the bone an effort to minimize the impact of sing electricity costs on an economy attered by double-digit inflation.

The money squeeze is regarded as erious enough to jeopardize Hydro's ility to supply power in the amount that ay be required by its customers in the ture. Availability of funds could take iority over the load forecasts in deter- ining what Hydro can build.

Inflation is the element underlying uch of the present financial bind. The pital intensive electrical utility industry particularly vulnerable to rising costs nd Hydro has been calling attention the damaging effects of inflation for veral years.

Speaking to the annual meeting of the ntario Municipal Electric Association, rly in 1969, George Gathercole, then airman, identified inflation as the ggest problem in Hydro's efforts to oduce and supply low-cost power.

"Even under the most optimistic fore- sts", he said, "cost trends must evitably lead to additional increases in e cost of electric power. Everyone sociated with Hydro has a stake in olding these increases within modest nits."

He went on to say: "Inflation psychol- gy is one of the most important oblems facing solution. The attitude wards inflation reminds one of Mark vain's comments about the weather — erybody talks about it but no one does ything about it."

Hydro has been attempting to run a trim ip for some considerable time but Mark vain's remarks about the weather can no nger be validly applied to inflation. Many e now trying to do something about it — cluding governments.

Hydro is caught between rising costs, er which it has little control, and the ed to meet inflation control guidelines. e availability of funds for capital expan- on is an over-riding constraint.

In response, the Hydro corporation is shing its 1976 work programs by some- thing like $50 million. Inevitably, some very important work will be discontinued, curtailed or re-directed.

This magazine is among the casualties of the cost-cutting operation. It is with deep regret that we announce the suspension of Hydro News after more than 30 years of continuous publication in roughly the same format and with a direct ancestry of publications dating back to 1916.

The first issue of Hydro News under its present name was published in June, 1942. Dr. Thomas H. Hogg, then Chairman, defined its role as "a Hydro family house organ." In the lead editorial Dr. Hogg said: "In setting out upon its mission, Hydro News adds a new and important link to the chain of goodwill forged by its reputable predecessor, the Bulletin, which was first published 28 years ago when the late and revered Sir Adam Beck was Chairman of the Commission.

"It will be the aim of Hydro News," the chairman went on, "to portray the passing panorama of Hydro life and progress throughout the province."

Leaf through the subsequent 33 years of Hydro News and the panorama is there.

Progressing from the role of electricity on the home front during the Second World War, the story reveals Hydro's all-out bid to match production with pent-up demand by harnessing remote river sites during the post war decade. Cycles of scarcity and plenty are chronicled in shifting marketing philosophies as Hydro and its municipal partners worked in close harmony to power a dynamic economy.

In later years, editorial emphasis shifted from the Hydro family concept to a more in-depth approach to matters of wider concern to the community affected by the growing Hydro presence. It was considered important to acquaint select external groups with the utility's policies and programs at a time when public attitudes were hardening against the very measures necessary to provide the public with the power it was asking for.

Returning again to Dr. Hogg and the first issue of Hydro News, he promised then that the magazine "would seek to maintain a standard which will be in keeping with the fine traditions of Hydro in this province."

Hopefully, we have at least come close. The winner of many accolades over the years for editorial and graphic excellence, Hydro News has long been acknowledged by professional communicators as one of the few top corporate publications in the country.

While the budget reductions were only carried out after a careful study to ensure minimum damage to the effectiveness of the Hydro operation, the results of the cutbacks over the longer term will be easier to judge in some areas than in others.

Communication is a nebulous commodity and its effectiveness difficult to measure.

Lack of dialogue is dangerous, of course, and Hydro is aware of its responsibility to keep the public informed. Other effective but less expensive methods of communications will undoubtedly be forthcoming to ensure that this aspect of the Corporation's mandate suffers no loss in priority.

Those of us who have been associated with Hydro News over the years wish to express our appreciation to all our readers for the interest they have taken in the affairs of this corporation. We can be excused, perhaps, for hoping it will be missed. □

Rate proposals reduced

by Bob Morrow

The Ontario Legislature's select committee has recommended, as an interim measure, that the proposed 25.2 per cent increase in Ontario Hydro's wholesale rates for 1976 be reduced to 22 per cent and that a further reduction should be studied.

At press time, the report of the 12-member committee* appointed to study the issue had been tabled in the Legislature. Two Liberal members, James Bullbrook of Sarnia, and David Peterson of London, did not sign the report.

The Ontario Energy Board had recommended an increase of approximately 27 per cent after prolonged hearings. (See page 4.)

The select committee also recommended that its term be extended from December 31 to March 31, 1976, "to allow the committee to fulfill its terms of reference in a responsible manner". The committee indicated a desire to make a detailed study of the expansion program for the provincial power system.

In its conclusions, the committee said it had "noted its concern that a strict application of the guidelines appears to allow Ontario Hydro to implement a rate increase of over 25 per cent."

But in proposing the interim 22 per cent, the committee said "the recommended reduction must take into account the right balance between the fight against inflation and the short-term financial integrity of Ontario Hydro and the Province."

The committee, too, expressed concern that a further reduction "may have a serious, adverse effect on the financial strength of both Ontario Hydro and the Province."

On the possibility of a further reduction in 1976 wholesale rates, the report said:

"The committee is very conscious of the possibility that Hydro's rates can be lowered even further than the committee's interim proposal suggests. Because of the (Ontario) Treasury's directive that Ontario Hydro cut its capital borrowing by $400 million in 1976, the committee expects Ontario Hydro to project a lower level of interest charges for the coming year and set its rate accordingly."

Discussing the impact on retail rates, the committee said "the increase for the mythical, typical, residential customer should . . . be 13.9 per cent. The committee noted that the reduction required to reduce the impact . . . to 12 per cent would result in a saving of approximately 30 cents per month for this customer over the committee's proposed rate.

". . . until the committee had conducted a deeper examination of Hydro's operations, it could not responsibly take the risk of suggesting such a cut," said the report.

The committee suggested that Ontario Hydro ensure that the municipal electric utilities operate within the spirit of the anti-inflation program in 1976.

During the committee hearings, the Ontario Municipal Electric Association, representing about 350 municipal utilities, supported the proposed 25 per cent rate increase and suggested it might be too small. The OMEA argued that today's customers should be paying a greater share of the costs of expanding the pov system to reduce Hydro's debt load.

The Association of Municipalities of Ontario last summer urged that the proposed wholesale rate increase should b cut to 12 per cent but later said that in view of uncertainties about costs the cc mittee should recommend less than 25 cent. "The association cannot recomm pricing in the dark," said counsel Gord Kaiser.

Hydro witnesses testified that a reduc expansion program is being studied, bu that amendments would likely not affec 1976 rates. There would be some effect 1977 and somewhat more in 1978.

As well, Hydro is studying ways to reduce administrative costs even more than the $30 million announced last Jul following the provincial mini-budget.

Milan Nastich, vice-president resourc said restraints on borrowing next year could force Hydro to choose between reducing system reliability or replacing planned nuclear power stations with fossil-fuelled plants.

The committee was appointed to lool into the proposed rate increase from th standpoint of federal anti-inflation guid lines. The guidelines were introduced a the OEB issued a report based on 55 da of hearings into Hydro's rate applicatio

*Members of the select committee are: Progressive Conservative — Frank Drea, Lar Grossman, Lorne Maeck, George McCague Douglas Wiseman; New Democratic Party — Ian Deans, Evelyn Gigantes, Donald MacDonald (chairman) and James Renwick; Liberal — James Bullbrook, Ray Haggerty ar David Peterson.

Integrity and Reliability:

Key issues in decision-making over rates

The proposed increase in Ontario Hydro wholesale rates for 1976, subject to lengthy public hearings last summer before the Ontario Energy Board, ran into choppy waters in the fall as a result of the changing political and economic climate.

Unexpected developments came in quick succession: election of a minority Conservative government with a New Democratic Party opposition, introduction of federal price and income guidelines, and referral of recommended increases to an all-party committee of the Legislature.

Previously, on July 7, the provincial government presented a mini-budget in which Hydro was directed to cut administrative costs by 10 per cent and to shave a minimum of $1 billion from its capital program between 1976 and 1985.

A key issue, reflected in statements by the Energy Board, Energy Minister Dennis Timbrell, and Ontario Hydro officials, is the need for appropriate rate increases to protect the credit rating of Hydro and the province.

The Ontario Municipal Electric Association, representing more than 350 utilities, expressed concern that a rate increase of less than 25 per cent could not "... be achieved without severely impairing the financial integrity of Ontario Hydro if they are to maintain an acceptable level of service and reliability."

The OEB issued an interim report, prior to the provincial election, saying that in its opinion that Ontario Hydro had made a prima facie case in support of its need for a rate increase."

The interim report was issued September 2 following those public hearings which started June 23 and continued until August 22. The hearings resumed the day the report was released and concluded September 15 after 55 sitting days (compared with 41 days in 1974). Evidence presented by Ontario Hydro and 29 intervenors ran into approximately 9,000 pages of transcript.

On October 10, the OEB issued its final report on Ontario Hydro's bulk power rate disposal (see following article) recommending an approximate increase of 27 per cent in wholesale rates for 1976. (The OEB plans to issue Part II of its report on matters not directly related to 1976 rate levels.)

Hydro initially proposed a 29.7 per cent increase but scaled down its request to an increase of approximately 25 per cent as a result of the provincial government's July mini-budget. At the same time, the Hydro board of directors authorized a $1.2 billion reduction in its capital construction program and ordered studies to determine whether additional cuts could be made without unduly jeopardizing the reliability and security of service.

The Hydro board also ordered a 10 per cent reduction in administrative costs that was expected to result in a saving of $30 million in 1976 and arbitrarily cut in half its proposed system expansion charge. A 60-day freeze on hiring staff announced at that time has since been extended.

However, evidence before the Energy Board showed that neither the cut in administrative costs this year nor the reduction in capital expenditures over a 10-year period would have any significant downward effect on 1976 rates.

"It is evident that with the current rates and those proposed for 1976, customers of Ontario Hydro in Ontario will pay less than cost for their electrical service."

□□□

"It is ... imperative that the financial integrity of both Ontario Hydro and the Province of Ontario be maintained to enable each of them to borrow capital at a reasonable rate."

— Ontario Energy Board report, 1975

The construction of generating stations to meet future power needs was also affected. In-service dates have been deferred six months starting with the second nuclear station at the Bruce Nuclear Power Development.

In a statement to the Energy Board on July 31, Hydro Chairman Robert B. Taylor indicated that deferment of in-service dates means reduction in generating reserves and increases the probability of major power interruptions at peak periods.

"For the year 1983 the risk of failing to have sufficient generating capacity to meet the peak load could be more than 10 times the customary criterion," said Mr. Taylor. "Some of the other plans reviewed by Hydro increased this risk by a factor of more than 75 and this is considered completely unacceptable, if not irresponsible."

He said deferment of nuclear plants will increase dependency on fossil fuels whose reliability of supply is already "a matter of serious concern."

On October 22 Ontario Hydro announced an increase of approximately 25 per cent in wholesale rates for 1976 in line with its previous commitment, almost two percentage points less than the increase recommended earlier by the Ontario Energy Board.

Effective January 1, the average wholesale rates to the 353 municipal electric utilities was scheduled to go up 25 per cent, and rates to 99 large industrial customers, served directly by Hydro, were increase an average of 25.2 per cent. The increase amounts to about $2.60 on monthly bills for the average residential customer.

In a letter to Energy Minister Timbrell, Mr. Taylor said "the most important consideration governing the Hydro board's decision was its public commitment that because of the economic stringencies of the times it could live with an increase of 25 per cent in 1976, although the substantial drop in revenue from the 29.7 per cent

Answering the questions

originally proposed would place additional strains on its financial resources."

In view of the anti-inflation measures being implemented by the federal government, and those taken by the provincial government in July. "the board decided it had an over-riding responsibility to abide by its commitment, despite the financial hazards this course entails," said Mr. Taylor.

Mr. Taylor said "the largest single contributor to the higher costs faced by Ontario Hydro in 1976 is the continuing increase in the price of fossil fuels. In addition, even by last spring, rises in interest rates and in the price of materials and services had pushed costs of doing business far below those estimated when rates for 1975 were established.

"The deficit forecast for this year (1975) is $127 million and the deficit for 1976, even with the 25 per cent increase, is forecast at $17 million, making a total of $144 million for the two years.

"While an increase of the magnitude proposed is to be regretted," said Mr. Taylor, "the board is convinced that the higher rates for 1976 are necessary and justifiable. The fact that the OEB reached a similar conclusion after 55 days of public hearings which produced 9,000 pages of transcript, serves to fortify that conviction."

In referring the proposed increases to an all-party committee of the legislature, Energy Minister Timbrell noted that Ontario Hydro witnesses had been extensively cross-examined by the board and by intervenors, including representatives of major industrial power users, municipal electric utilities, municipalities and consumer groups.

The OEB accepted Hydro's submissions in support of its 1976 bulk power rates as "reasonable and as precise as they can be in a time of considerable uncertainty." It also accepted Hydro's forecast of escalation in costs of fuel, material and manpower, which are major factors in the need for a rate increase.

The OEB stated that "as a fundamental principle, revenue of Ontario Hydro must cover the costs of operating and maintaining the system," said Mr. Timbrell.

"A second concern . . . is that Hydro's financial integrity be upheld by ensuring a proper balance between rate increases and new debt," said Mr. Timbrell. "The Energy Board has recommended rate increases which minimize borrowing in order to preserve the financial position of Ontario — and I would point out that since the Province guarantees Hydro's debt, the Province's financial standing is also involved."

Mr. Timbrell noted that the OEB warned against a further increase in the proportion of borrowing by Ontario Hydro and expressed his "third concern . . . that the interests of the Ontario public continue to be served by adequate supplies of electric energy for the future."

Mr. Timbrell said the all-party committee will be instructed to determine whether or not the rate proposals for 1976 are in keeping with the federal anti-inflation program, and report its findings before the end of the Legislature's fall session.

"If such rate increases are not in keeping with the federal program," said Mr. Timbrell, "the committee is to report to the Legislature with recommendations."

The special committee, whose chairman is Donald McDonald (NDP-York South), consists of five Conservatives, four New Democrats and three Liberals. It held its first meeting November 5.

A number of crucial questions were rais during the Ontario Energy Board's hear ings into Ontario Hydro's proposed whc sale rate increases for 1976. In dealing with "voluminous evidence on complex issues" in its final report, the Energy Bo responded with answers to those questions . . .

Will the proposed rate increases cov costs?

". . . rates charged to Ontario custom in 1975 are insufficient to permit Ontaric Hydro to recover all of the costs asso- ciated with servicing these customers," said the board.

"Moreover, the rates proposed by Ontario Hydro for 1976 and 1977 will no recover all of the costs estimated to be incurred in those years.

"By the end of 1977, the cumulative revenue deficiency will amount to $138 million. However, Ontario Hydro's forec surplus for 1978 will, if realized, recover but $12 million of this amount."

The board urged that any profit derive from exporting surplus energy be applie to offset any revenue deficiency resultin from the operation of the Ontario systen but "as a fundamental policy, Ontario Hydro should recover from its Ontario customers revenue at least equal to the total costs of serving them."

The board suggested that profits from exports should be considered separatel as "extraordinary income" and applied against the appropriation for system expansion. It stressed the "necessity fo system expansion charge to be imposec and collected annually."

Is Hydro's forecast of power demanc in 1976, 1977, and 1978 too high?

Ontario Hydro contended that "the fo cast is reasonable and if it is in error it is more likely to be low than high."

Evidence to support the view that the load forecast might be high "was not su cient to convince the board that Ontario Hydro's estimate is likely to be signifi- cantly in error, at least in the short term,

aid the report. "Ontario Hydro has demon-trated an acceptable record with respect o the accuracy of its past forecasts and ne board finds no reason to suppose that s most recent forecast will not be to the ame standard."

But the board cited "a great many ncertainties" about economic recovery, nd the combined effects of substantial ate increases and the conservation ethic nd said: "It is the view of the board that ny major departure in the actual demand om the forecast levels would most likely end towards a lowering of demand, articularly of energy." The result would kely be to decrease both revenues and el costs and to increase slightly revenue eeds.

■ *What role should export of surplus nergy play, if any, in meeting Hydro's evenue requirements?*

"The board is of the view that the export ale of surplus interruptible capacity and nergy constitutes a valuable source of evenue to Ontario Hydro and recommends at Ontario Hydro vigorously pursue xport opportunities within its presently stablished policy framework."

"... the board accepts Ontario Hydro's tionale that the export ... does not con-ibute to the level of generation installed the system as, in the absence of such ales, the fixed charges on existing capital cilities would still constitute an element cost."

The board agreed that revenue derived om export sales must recover fully all osts incurred, including social costs that ight be attributed to air and water ollution.

Commenting on Ontario Hydro's current harge of 0.4 mills per kilowatt-hour in its ice of export power to reflect social osts, the board said that "profits resulting om secondary energy sales (exports) are all probability, more than adequate to mpensate for the social costs likely to established as reasonable."

■ *What about the effect of rising fuel prices?*

Ontario Hydro predicted that fuel prices will continue to increase sharply over the next five years, after which they will tend to reflect world inflation rates.

The board accepted the conclusion that the fuel price forecast is "not unrealistic" but expressed concern that unforeseen circumstances could cause potential error.

In response to a question from the Association of Municipalities of Ontario on what steps Hydro is taking to protect customers against rising fuel costs, Hydro said the low fuelling costs of nuclear power stations ensures that once they are brought into operation, their total annual costs are relatively free of iinflation effects.

The board said "the increase in fuel costs is the largest single contributor to the need for higher bulk power rates."

■ *Are rates fair to various classes of customers?*

This issue has long been a contentious one with complaints that rates discriminate either against municipal utilities or direct industrial customers.

The board said it "continues to hold the view expressed in its 1974 report ... that Ontario Hydro is constantly endeavouring to establish rates for all of its customers that are fair to each customer and class of customer, and what, at the same time, reflect the cost of serving each customer and each class of customer."

■ *What steps should be taken to help finance Ontario Hydro's "ambitious capital expenditure program"?*

Ontario Hydro has, at present, only two sources of funds, internally generated revenues, which depend on rates and the level of surplus energy exports, and on capital borrowing.

Borrowing is expected to increase from the 1973 and 1974 levels of $562 million and $741 million, respectively, to $1.5 billion in 1975, $2 billion in 1976 and increasing to about $2.6 billion by 1980.

These requirements, after cutting $1.2 billion from the system expansion program in response to Treasurer Darcy McKeough's directive last July, still total over $12.8 billion for the period 1975 to 1980.

"It is, therefore, imperative that the financial integrity of both Ontario Hydro and the Province of Ontario be maintained to enable each of them to borrow capital at a reasonable cost," said the board.

The board noted that Hydro's debt ratio had risen from 72 per cent in 1967 to 78 per cent in 1973 to 81 per cent in 1975 with a projected ratio of 85 per cent by 1978 and pointed out that counsel for the Ontario Municipal Electric Association and the board had both urged steps to prevent any further increase.

"The board continues to hold the view that there is no particular debt-equity ratio that is absolutely correct for Ontario Hydro," said the report. "However, the Board is concerned with the deteriorating trend of the debt ratio and the increasing level of borrowing. The combined effect of this may adversely impact on Ontario Hydro's own financial integrity and ultimately on that of the province."

■ *What role do interest rates play in Hydro's costs?*

The board identified interest rates as "one of the major expense items in any year of operation" and accepted Hydro's forecast as a basis for determining revenue requirements in 1976.

Interest expense for 1975 was estimated at $271 million, rising to $319 million in 1976, $423 million in 1977 and $511 million in 1978.

During the Energy Board hearings this summer, Hydro forecast a 9 per cent rate on intermediate and long-term bonds during 1975 and 1976. Since then it has announced a $125 million bond issue in Canada with record-breaking rates of 10¼ per cent on 10-year bonds and 10.87 per cent on 25-year maturities. A subsequent $300 million bond issue in the U.S. consisted of two maturities with yields of 8.4 and 9.3 per cent.

What would be the effect on 1976 rates of a $30 million reduction in Hydro's administrative costs?

"Any changes to controllable expenditures . . . will have little impact on 1976 rates," said the board.

Hydro lawyer Pierre Genest pointed out in his submission that the greatest proportion of wholesale costs "are, in a very real sense, beyond the control of the corporation at least within the relatively few years which bear on the 1976 bulk power rates."

Of the forecast bulk power cost, 32 per cent is attributable to fuel and like costs, 34 per cent to interest and depreciation and 6 per cent to statutory requirements for debt retirement. Only 28 per cent is attributable to operation, maintenance and administration.

Of the $30 million reduction in general administration costs introduced after Treasurer Darcy McKeough's mini-budget, only $16 million would affect 1976 wholesale rates. The effect would be to reduce 1976 rates by about two-tenths of 1 per cent.

The board accepted the financial forecast for setting 1976 wholesale rates but expressed reservations about whether it's "proper and reasonable" for subsequent years.

Should Hydro consider incurring a higher debt-equity ratio or issue common or preferred shares?

Both the Association of Municipalities of Ontario and the Canadian Association of Consumers proposed such measures.

Said the OEB: "The CAC recommended that, because of the exceptional economic circumstances facing the province, the statutory debt retirement charge (used to retire Hydro bonds) and the system expansion charge (used to help finance new construction) not be collected in 1976.

"The board is of the view that failure to collect these charges, even in the short term, would be irresponsible.

"The board has no doubt that if the system expansion charge is not maintained, either because of a policy decision, or cannot be maintained because of a revenue deficiency at a level which arrests the declining trend in financial ratios, Ontario's financial position, and the province's as well, will be jeopardized."

The board urged Hydro and provincial authorities to co-ordinate their borrowing requirements.

"The board is of the opinion that Ontario Hydro must generate more funds for capital expenditures through its own internal revenues (that is, through rates) rather than through continued higher borrowing. The board agrees with the Ontario Municipal Electric Association that the credit rating of the province must not be allowed to suffer because of Ontario Hydro's capital requirements."

Can rates and borrowing be reduced?

The board said "it is evident . . . that the only way that both the level of rates and borrowings can be reduced is to cut back or defer the system expansion program to conform with the financial constraints facing Ontario Hydro.

"The board realizes that such actions would have little effect on 1976 bulk power rates, but the board firmly believes that unless Ontario Hydro's system expansion program is re-examined in light of possible financial consequences, the future holds continuous unprecedented rate increases for its customers."

(The Royal Commission on Electric Power Planning, headed by Dr. Arthur Porter, has started hearings into Hydro plans for expansion for the period between 1983 and 1993. It is expected to make recommendations on an appropriate rate of growth for the provincial power system.)

Will the proposed rate increase be inflationary?

"The board agrees (with many intervenors) that further increases in the price of a commodity as basic as electricity will inevitably contribute to inflation and will impact most adversely on those consumers with limited incomes."

However, the board concurred with Hydro lawyer Pierre Genest who said ". . . (Ontario Hydro's) mandate is to provide, as a delivery agency of the Province of Ontario, electric energy to the people of Ontario at the lowest feasible cost . . . It i not Ontario Hydro's place to establish and implement policies governing its activities for the purpose of influencing t economy of the province one way or the other. Such policies are the business of the government and Ontario Hydro is bound to accept and act upon policy directives from the government."

Ontario Hydro argues that its role, as defined in the Power Corporation Act, requires full recovery of all costs. it does not consider itself to be in the best positi to judge which actions might be most appropriate to rectify whatever economi malaise may be afflicting the province at any particular time.

". . . the board agrees that Ontario Hydro, on its own initiative, should not be required to make judgments on matters and issues that are beyond the normal purview of an electric utility company."

Can Hydro achieve further cost reductions?

Yes, said the board. "The fact that the board has recommended an increase in bulk power rates somewhat greater than proposed by Ontario Hydro is not intend to imply that the board is satisfied that Ontario Hydro is unable to effect further cost reductions and productivity improve ments.

". . . Ontario Hydro not only must achieve all possible cost and productivity improvements, but it also must reduce future capital expenditures to an absolut minimum even if such measures result in lower than traditional level of system reliability and security."

Where the blame lies

In common with all Canadian corporations, Ontario Hydro has suffered severely om the effects of double-digit inflation the past year," says the Ontario Energy oard report on 1976 rates.

The report quotes an exhibit filed by hairman Robert B. Taylor of Ontario ydro to illustrate the impact on Hydro osts.

"The price of almost everything that ydro needs to produce and distribute ower has increased sharply," said Mr. aylor.

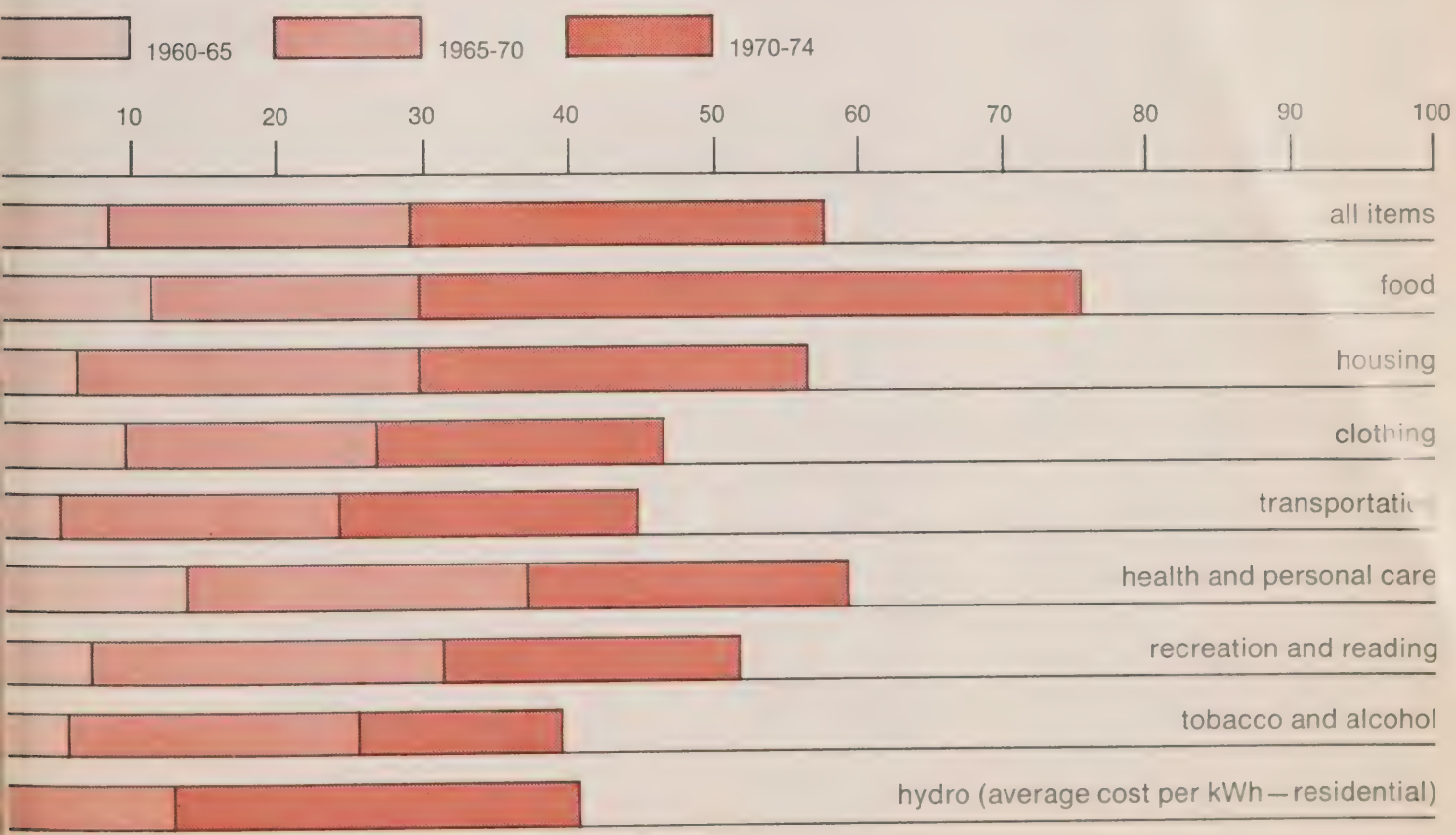
"The largest single contribution to igher cost is the continuing increase in he price of fuels, which accounts for bout 25 per cent of Hydro's total revenue eeds in 1976.

"The price of coal (45 per cent of Hydro's installed capacity is coal-fired) went up 55 per cent last year. We estimate that it may increase by 57 per cent in 1975 and by a further 21 per cent in 1976.

"The cost of major electrical and mechanical equipment went up by some 25 per cent last year and construction equipment by more than 30 per cent.

"The cumulative effect of these increases is enormous. As an example, it cost three-quarters of a billion dollars to build the Pickering nuclear station, which was completed in 1973. The estimated cost of its twin, Pickering B, due for completion in 1982, is nearly three times that figure — two billion dollars." □

percentage increases based on consumer price index for Canada



The remarkable

'Glen Nevis' is almost hidden from view as you drive along the Niagara Parkway. The stately elms camouflage the shingle-sided home, giving it an air of privacy in keeping with the life style of its owner — Richard Lankaster Hearn.

In contrast to the dramatic role Dr. Hearn has played in the development of Ontario Hydro and the province, he and his wife, Ethel, have always been private people. In the park-like setting of 'Glen Nevis', high above the Niagara River, that privacy is assured.

Still the highlights of those remarkable years in the public eye are fresh in his memory, and shortly after his most recent birthday — his 85th — he recounted them for Hydro News.

Settling into a comfortable chair in his living room, the former Hydro chairman spoke precisely and in subdued tones, after mentally sorting out the details of that long, historical working career which began in 1913 with the fledgling Hydro-Electric Power Commission of Ontario, then but seven years in existence.

His Hydro career is unique, too, for no other employee has ever travelled the route of Richard Hearn. He started out as a design draftsman working on Wasdell Falls generating station, the first plant constructed by the public utility. When he retired, in 1956, he was sitting behind the chairman's desk and had guided Hydro into the nuclear age.

Once referred to as one of "Beck's bright young men," Dr. Hearn is the only surviving member of that team of brilliant engineers that planned, designed and built Hydro's first expansion program.

That was the time when designs and drawings for major projects were laid out on kitchen work tables. But it was also the time that set the stage for Hydro's future successes and established an efficient electrical system that was a boon to the provincial economy.

Many problems associated with the design and construction of the early generating stations, particularly with the first Sir Adam Beck plant which was the largest hydro-electric development of its day, had to be solved. There were difficulties, as well, with the rural electrification program and the development of power systems for the mines and lumbering centres of the hinterland.

These challenges were met and "Beck's bright young men" — F. A. Gaby, Harry Acres, Tommy Hogg, Otto Holden, J. J. Trail and Dr. Hearn — were honored, many times, for their contributions to the engineering world and the public utility.

For Richard Hearn though, a man of great energy and initiative, those first few years with Hydro just whetted his appetite for adventure and discovery. During the next 40 years, he became involved in major engineering projects throughout the continent, with Hydro, and other power companies, consulting firms and the Canadian government.

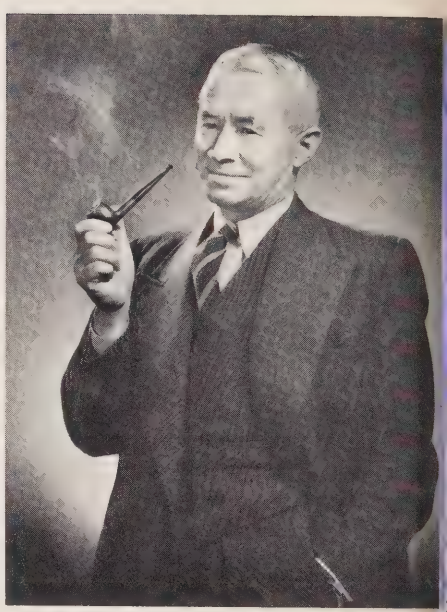
"I always enjoyed doing what nobody else had done," he says, and as his fame spread, the demands for his skills increased.

Not surprisingly, that demand continued into retirement.

Until 1973, Dr. Hearn had spent an active retirement. He was a consulting engineer for a number of years and served as director for several firms, including Atomic Energy of Canada Limited, Brazilian Traction, Light and Power Company (now Brascan Limited), British Newfoundland Corporation Limited — Twin Falls and Churchill Falls Developments in Labrador, CBA Engineering Ltd., a consulting firm in Vancouver, B.C., and Great Lakes Power Company Limited. He was also a member of the Founders' Committee for Brock University in St. Catharines, and in 1967 became that institution's first chancellor.

But, in 1973, he was laid low by a nine-month illness. "The doctors thought I'd reached the end of the line," he says, "yet here I am."

Life has been slower since then. "My wife and I go for a swim most days during the summer in the swimming pool on our property, and we take advantage of the



Shaw Festival at Niagara-on-the-Lake about three times during the summer. I s take great interest in photography," he adds, "and I spend much time reading travel stories and biographies from my 6,000-book library."

When asked if he plans to write his memoirs, the reply is no, though the form chairman says he has given some thoug to letting Brock University's Dr. James Gibson tackle the job. "I've always hatec writing," Dr. Hearn explains, "whether it was for engineering reports or speeches

That 1973 illness was not his only brus with fate.

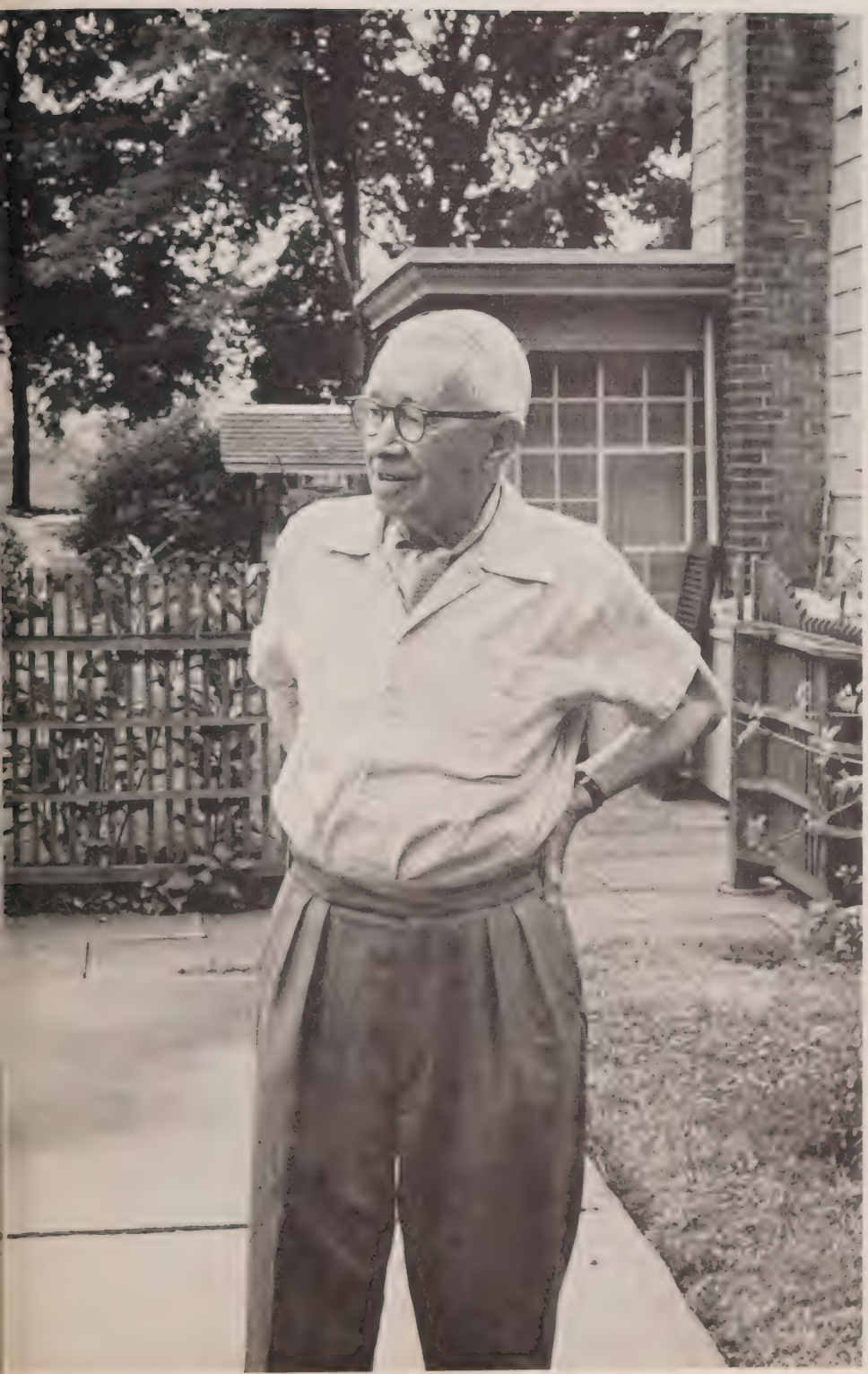
"On January 16, 1955, that tragic day when chairman Bob Saunders was killed in a plane crash en route from Windsor t Toronto, I was in Detroit for a speaking engagement. Bob called me to see if I wanted to meet him in Windsor and fly back to Toronto. I was going back to 'Gle Nevis' that night, so I declined the offer. It was more convenient for me to take the train."

Eight days later, Dr. Hearn was appointed chairman and served in that capa city until he retired in October, 1956.

An article in the Star Weekly of the day

Richard L. Hearn

by James Dunn



said: "Hearn has drive, initiative and vision. Of the gentleman and scholar breed, Dick Hearn has a mild, unassuming and gracious manner which is amazingly deceptive. Close associates recognize him as a tiger of a man with a razor-sharp keenness — and a prince of a man to work for."

Now, after 19 years of retirement, he still maintains a great interest in Hydro. Until a few years ago, "I still knew many of the men at the utility but, today, Henry Sissons (vice-president distribution) and Harold Smith (vice-president engineering and operations) are the only two who came on the staff during the period I was General Manager and Chairman."

Dr. Hearn has not lost his admiration for Hydro. "It's not easy to build an organization like that. Not one project it has undertaken has gone bad," he says. "When I was at Hydro there was also a sense of family, of trust among the employees."

Recognizing that policies and practices have changed since he retired, Dr. Hearn says "change had to come. Things have to move or die and those in positions of influence lead them in what they think is the right direction.

"When you look at the world situation, you realize how fortunate we are in this country to have leading us the people we do," he continues. "They're not perfect, but I believe they have the best interests of the public at heart."

Commenting on the introduction of public participation into Hydro's planning process, he feels it is a good thing. "Of course, I'm no longer involved in planning Hydro's future. Public participation must create headaches for those responsible for meeting this province's future power needs, but I am certain the better informed and educated the public is, the better it will be for all of us."

Referring to the current public concern about energy and its cost, Dr. Hearn agrees we cannot waste our resources, but thinks the responsibility for ensuring that does not happen rests on the shoulders








NUCLEAR
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RICHARD L. HEARN







the public as well as the utilities and
usiness.
"The price of power and other forms of
ergy has to go up. Perhaps that is the
ly way wasteful consumption will be
t," he comments. "We cannot continue
kid ourselves that costs can be kept
wn. These matters are beyond our con-
l. It's a matter of world economics.
e can no longer refer to 'our economy'.
"Ontario is fortunate to be in a favorable
ergy position," he adds. "If we don't
preciate that fact and continue practis-
g wasteful energy consumption, we will
stroy that situation."
Dr. Hearn realizes old habits die hard,
t says most people could easily cut
ck, by 10 to 15 per cent, the amount of
wer and fuel they consume. "If they
n't, rising prices will probably force
em to."
Looking at Hydro today, Dr. Hearn says:
take greatest enjoyment and pride
m the success of the Candu nuclear
gram, because I was involved with it
ring the development stages. I acted
re or less as a catalyst in getting Dr. (C.
MacKenzie to set up the organization
ich today is known as Atomic Energy of
nada Limited, and I helped to persuade
emier Leslie Frost to support Canada's
clear program."
As a result, Hydro today, with Pickering
nerating station and the Bruce nuclear
wer development, is very much a
ature of Richard Hearn's vision, initia-
e and persuasiveness.
Yet his Hydro career began when public
wer was still a topic of considerable
isiveness, when Wasdell Falls, Eugenia
ls and the first Queenston station were
he design stages.
His first career with the Commission
ted only eight years. Once the Queen-
n-Chippawa plant (Sir Adam Beck No.
eared completion, its design and
nstruction problems solved, Richard
arn was on the move.
When I was 31, in 1921, I took a posi-
n as assistant chief engineer with the
shington Water Power Company in
kane, Washington, but in 1924 I came back to Niagara Falls at Harry Acres' invitation to become a partner in the consulting firm which is now known as H. G. Acres Company Limited.

"In 1930, the beginning of the depression, work was so scarce that I decided to leave Acres and took a job with Dominion Construction Company and H. F. McLean Limited, becoming their Chief Engineer in 1934. I stayed there until 1942 when I returned to Hydro.

"That's how I got some of my experience in the construction field."

And some experience it was. In addition to the Washington Water Power Company involvement, Dr. Hearn helped Harry Acres with the design and supervision of construction for the duplicate water system for the City of Toronto. While with the Dominion Construction Company they had the contract for the Ivy Lea Bridge on the U.S. side of the St. Lawrence River, in the Thousand Islands area.

By 1942, his fame had spread and Hydro Chairman Tommy Hogg persuaded him to rejoin Hydro as his executive assistant.

"I was back only a short time when Hydro loaned me to the federal government to participate in the war effort," he recalls. "I went to Sarnia to become chief engineer in charge of construction for the Polymer Corporation's synthetic rubber plant.

"When that job was completed, in 1944, I was off on loan again. This time I was sent to Washington, D.C. to represent the Canadian government, acting as technical adviser to the Public Utilities Division of the Combined Production and Resources Board."

He returned to Hydro a year later, as chief engineer of Design and Construction, and later served as general manager and chief engineer, before becoming chairman.

When George Drew offered him the job of general manager and chief engineer, during the re-organization of 1947 (there was no chairman at the time) he said he would accept only if there was no political interference in the day-to-day operations of the organization. Mr. Drew agreed and "there never was," Dr. Hearn states emphatically.

In these senior positions, Richard Hearn played a vital role in Hydro's post-war expansion program which included the huge St. Lawrence development, the second Queenston plant and the construction of Hydro's first thermal plant which has been named after him — the Richard L. Hearn Generating Station in Toronto.

He found time, as well, to complement the beauty and appeal of the Niagara area, by overseeing the construction of the floral clock adjacent to the Beck plants. "I was inspired by the floral clock in Edinburgh," he says.

It was in this period, too, that he foresaw the potential of nuclear power and worked closely with C. D. Howe, Dr. C. J. MacKenzie and others, to establish AECL and the Nuclear Power Demonstration plant at Rolphton in the Ottawa Valley.

It's not much wonder he received widespread recognition for his contributions to both Ontario and Canada. Most recently, in 1974, he was made a member of the Order of Canada.

His doctorate of engineering was conferred on him by his alma mater, the University of Toronto. The Engineering Institute of Canada awarded him the Julian C. Smith Medal and the Sir John Kennedy Medal "for achievement in the development of Canada." In 1966, the Association of Professional Engineers of Ontario presented him with its Engineer's Me not only for his contribution to hydraul engineering but for his prominence in t area of nuclear energy.

For a man born in Victorian Toronto, who, in 1903, took photographs of Osgoode Hall and Queen's Park to sell to department stores as calendars, the personal transition from design draftsman to proponent of nuclear power, represents an extraordinary, unparalleled achievement.

With a career such as his, it might be hoped that Dr. Hearn will overcome his aversion for writing and embark on a new venture — as author of his memoirs. □

fat cat of the gases



by John Dalrymple

A look at hydrogen's energy potential

It seemed a bit far out, back in 1874, when Jules Verne wrote *The Mysterious Island.* In it, an engineer described how the vast reserves of hydrogen locked in the seas could be burned to provide limitless power, with the only byproduct being water vapor that returned to the sea.

In this era of the energy crunch, with soaring oil and gas prices and depleting fossil fuels, scientists are polishing some fiction off that science fiction concept. Hydrogen supporters believe that the simplest, lightest element in the universe, and ninth most abundant on earth (by weight), can be wed to electricity to establish an electric-hydrogen energy dynasty of the future.

This dynasty, depending on which source you lean toward, could begin its reign anywhere from 20 to 80 years from now.

Although not yet actively experimenting with hydrogen processes themselves, Ontario Hydro researchers are keeping close tab on studies being done elsewhere.

"It's a long way off, and we have enough problems right on our doorstep," says G. Harold West, supervising engineer in the utilization section of Hydro's Research division. "But we can't afford to ignore it."

Along with studies of several other "exotic" energy alternatives of the futur Ian Wilson's process development grou in Hydro's Generation Concepts Depart ment recently completed a status report summarizing prospects and problems o harnessing hydrogen in years to come.

Like electricity, hydrogen is not a primary energy source. Both must be obtained from other, more basic energy mainsprings. And either can be used in t manufacture of its mate.

Despite doomsayers, there is plenty o raw energy around, energy experts agre The real problem is that most of it floats around in places and quantities, at times and in forms that aren't economical or convenient to use.

The blazing July sun that fried eggs o a downtown manhole cover can't be use to warm a cup of coffee this winter. Exce water churning down a Hydro dam spill way last spring can't power a factory thi fall. Winds, tides and the earth's interior heat are available either sporadically or in awkward places.

Electricity must be used the instant it i generated or (with minor exceptions) be lost forever.

If this wasted energy could be scoope and "bottled" for future use, it would be energy in the bank.

Some researchers see straight hydrog as electricity's most attractive partner fo

uch a joint energy bank account. Others, cluding some in Hydro ranks, favor ore easily accessible (and more ener- etic) hydrogen-carbon compounds that an be stripped out of oil, coal or natural as.

These alternates, in which hydrogen is ne of the key building blocks, include ethane gas (CH_4) and methanol (CH_3OH), synthetic wood alcohol.

Canada's diminishing fossil fuel eserves tend to rule out large-scale anufacture of either of them. The only as-to-methanol synthesis plant in the ountry is Celanese Canada Limited's mall facility at Cornwall, based on oil efinery naptha. To be handily portable nd storable, methane needs to be liquified a chilly —163 degrees C.

To date, ordinary gasoline is the most onvenient and energy-packed transport- ble fuel on the general market. When urned, an Imperial gallon of gasoline elds about 138,000 BTUs. (Unfortunately, ost of this heat is wasted by the efficient internal combustion engine.)

Methanol has a calorific value of 68,000 TUs per gallon. Liquified methane gives ,500 BTUs. A gallon of liquid hydrogen ails with only 36,000 BTUs.

The gimmick is that a gallon of liquid drogen weighs a great deal less than a allon of anything else. Its power per ound has long fascinated the U.S. Air orce and the National Aeronautics and pace Administration. Studies indicate a mbo jet could fly halfway around the orld, carrying its usual payload, if fuelled liquid hydrogen — despite the extra eight and bulk of hydrogen fuel tanks. oxygen rather than air were used to pport combustion, the aircraft's exhaust ould be merely water vapor.

Just as the food and beverage industry s found it uneconomic to collect and use empty containers, so the present ergy industry can't afford to collect and cycle used "energy containers"— mainly e combustion products of fossil fuels. The "no deposit, no return" system, in th cases, throws the big recovery rden on the environment. For the energy cycle, millions of years are needed to reform fossil fuels from carbon dioxide and other compounds.

Burning hydrogen in air at normal combustion temperatures emits almost pure water vapor and small amounts of nitrogen oxides, which can be controlled.

Hydrogen was a major fuel used in the space rockets that put men on the moon. Already it has a big market in industrial processes. But it is still substantially too expensive and too tricky to handle for practical use in automobiles, trains, ships, planes, home heating, kitchen stoves and factory furnaces.

Nevertheless, experimental hydrogen-burning cars now zip along highways in several U.S. states, boasting up to 40 per cent improvements in engine efficiency. over conventional gas fueling. Billings Energy Research Corporation has modified several conventional cars to run on either gasoline or hydrogen fuel at the flick of a switch. Hydrogen gives superior performance, the company says.

The firm is now converting a 20-passenger bus to be the prototype for a proposed 15-bus fleet in its hometown of Provo, Utah. An oil company is considering setting up a coal gasification plant to produce the hydrogen the public transit system will need.

A whole range of home appliances has been operated on hydrogen in the Institute of Gas Technology's experimental "Hydrogen House", a mock-up exhibit that has been displayed since 1973 in several U.S. cities and which is kept stored in Chicago when not on tour.

The three main hurdles to a "hydrogen economy" are: producing the gas cheaply, storing it compactly, and distributing it efficiently.

Once these are overcome, modifying burners and machinery to use it would be a gigantic but relatively simple job. For example, hydrogen's tendency to backfire in internal combustion engines (somewhat similar to early problems with gasoline) has been largely overcome by injecting a little water vapor with the incoming gas.

Hydrogen researchers are currently focussing on production and storage problems of the gas, notes Allen Barnstaple of Hydro's Generation Concepts Department. Studies on other aspects of hydrogen are mostly "paper work", he says.

The ultimate source of hydrogen fuel will almost certainly be the water that covers more than two-thirds of the earth's surface. As yet, it doesn't make economic sense.

To generate hydrogen by electrolysis, you can't just dump positive and negative wires from a dry cell into a beaker of water add a pinch of salt to make it electrically conductive, then capture the bubbles, as you did in high school. But the principle is the same.

Some scientists envision great floating platforms on the ocean, some miles off shore, on which a series of big nuclear power plants would be built. Their electricity would be used on the spot to decompose seawater to generate huge amounts of hydrogen that could be pipelined to shore.

Using electrolysis like this, theoretically, 79 kilowatt-hours of electricity are required to produce 1,000 cubic feet of hydrogen at standard pressure. Even the best industrial electrolysis plants only approach about 60 per cent efficiency. So a typical production figure is 150 kwh per 1,000 cubic feet. Then there are the inevitable efficiency losses when the hydrogen is converted back to electricity or other forms of useful energy.

One improvement being investigated is high-pressure, high-temperature electrolysis. Operating at about 200 atmospheres and more than 200 degrees C, efficien goes way up, as high as 90 per cent, according to researchers at Oklahoma State University. As an additional benefit, hydrogen produced under pressure can b stored directly in pressure tanks without an energy-costly compressor step.

Direct thermal decomposition of water — that is, dissociating the hydrogen and oxygen by simply heating the water to high enough temperatures — is a possibility. But the needed temperatures of more than 2,500 degrees C aren't feasible today.

Closer is thermal-chemical decomposition, being experimented with at the Common Market's Euratom research centre in Ispra, Italy. It is based on combining water's hydrogen and oxygen with other chemicals, then extracting them separately in a series of high temperature steps. Although the 800 degree C temperatures still needed are well beyond those available from existing nuclear reactors, such as Candu, high temperature gas reactors may be capable in future of attaining these temperatures. Radiation, corrosion and providing plumbing and piping that will survive, pose formidable challenges.

Still, Euratom scientists hope they can cut hydrogen production costs by almost half, perhaps by 1985.

Some scientists point out that solar concentrators (basically, kingsize magnifying glasses) could produce sufficient heat. If this proves out, solar concentrators could produce hydrogen thermo-chemically in small plants, getting away from the need to centre hydrogen production around huge nuclear installations.

At present, hydrogen can be extracted more cheaply and efficiently from natural gas, oil and the reformation of coal than from water. But it is the dwindling of precisely these hydrocarbon fuels that is causing the energy concern in the first place.

Still, Canada has substantial coal reserves — enough to supply the country's energy needs for many years to come.

Widespread use of hydrogen will depend more on outside factors than on development of a hydrogen technology itself, Mr. Barnstaple believes. The largest factor will be a dollar sign.

"The biggest thing is: what is going to happen to the price of coal?", he says. "Coal costs are going up along with general mining and transportation costs. And everybody today wants clean fuel. In the future it will probably be necessary to clean up the coal before use.

"The economics of using coal may reach a point — perhaps not too far off — when it will be attractive to convert coal to hydrogen right at the mine, and distribute the hydrogen by pipeline."

The optimistic cost of hydrogen produced from coal reformed at the mine is about $3.50 per million BTUs—and this is based on a very low coal cost.

No matter what its source, hydrogen must obviously cost more than the original hydrocarbons, electricty or nuclear power from which it stemmed. At present, it costs about three times as much per unit of energy as natural gas.

But, if production costs can be whittled away, hydrogen has offsetting advantages. Among them are convenience, cleanliness, and adaptability to a wide range of domestic, industrial and transportation uses. Above all, it can be manufactured from off-peak power or sporadic power sources.

Hydrogen distribution by pipeline, probably using the natural gas network already in place, is the most frequent answer to distribution questions. Even that poses some problems. Hydrogen diffuses through many metals, and tends to react with iron carbides in high strength steel to make it brittle. Because hydrogen gas contains only one-third as much energy as natural gas (by volume) larger compressors would be needed.

Still, pipelines are cheaper to build than overhead high voltage transmission lines. In turn, underground power transmission lines cost at least 10 times more than overhead lines. In either case, the underground route is less subject to storm damage and environmental complaints.

A 185-mile hydrogen pipeline has operated for years in Germany's Ruhr area. And liquified hydrogen, at —253 degrees C in insulated vacuum containers, or as a pressurized gas at 2,000 psi, is regularly shipped around the U.S. and Canada in railway tank cars and trucks.

While hydrogen's energy content per unit of weight is gorgeous, its energy content by unit of volume is definitely unattractive. It suffers from the unusual problem of being "light but fat".

Most of the current research on hydrogen storage is aimed at this "weight-watchers' problem".

For example, a 50-gallon tank of liqui hydrogen would be needed to carry an automobile about as far as a 20-gallon gasoline tank. Including the super-insulation needed, the hydrogen tank would take up a great deal of the back seat. Using hydrogen in massive pressurized bottles would take up five or six times as much room, and weigh well ov two tons — compared to about 160 pour for the standard gasoline tank and contents.

Best current storage bet is in contain of powdered metal hydrides, which abs hydrogen into their structure like "a sponge" in concentrations of up to twic that of liquid hydrogen in the same volu The hydrogen can be released in a stea stream by heating the container moderately — probably from the exhaust pipe the engine coolant. When the heat is removed, the hydrogen release stops promptly. The "squeezed out" and exhausted metal hydride can then be recharged by forcing gaseous hydroger into it again.

The charged metal hydride tank woul still weigh something between 600 and 1,000 pounds for a "full tank of gas", but approaching reasonable limits.

The National Research Council of Canada has developed a model of this system. And in the U.S. Battelle Memoria Research Institute of Columbus, Ohio (which has frequent research ties with Ontario Hydro) has an experimental hyd gen production and hydride storage system in operation now.

Certainly, the hydrogen-powered car however distant—seems to be the enviro mentalist's answer to exhaust pollution.

A few years ago, two hydrogen-power cars topped 61 others in an Urban Vehic Design Competition conducted at Gener Motors' proving ground in the U.S.

The winner was a modified Volkswage refined by a group of students from Utah Brigham Young University. Its exhaust fumes were so clean that car owners of the future may find it attractive to switch to hydrogen fuel—even if they have to to their gas tank behind them on a trailer. □

OMEA district meetings

Dialogue demand causes delays, Timbrell says

ntario's power consumers face a "severe conomic penalty" because of delays — ought about by increased demand for alogue by the public — in building the st of two 500-kV lines to carry power om the Bruce A nuclear power station on ake Huron, says Energy Minister Dennis mbrell.

Speaking to the Ontario Municipal lectric Association's District 1 annual eeting in Ottawa, Mr. Timbrell said cause of these delays Ontario Hydro will forced to burn more expensive fossil els to supplement the Bruce plant output til the line is completed.

He pointed out that the line was origin- y scheduled to be in service in June, 77, to carry power from the third unit at uce A, which is slated for operation late 1977.

"But," Mr. Timbrell said, "due to the tended dialogue demand by the public, e first Bradley-to-Georgetown trans- ssion line cannot now be ready until late 178. There will, as a result, be a severe onomic penalty to the electricity nsumers of Ontario because of the need burn more expensive fossil fuels until e line is ready."

Mr. Timbrell also noted there will be usable generating capacity at the nnox generating station near Kingston, dro's first oil-fired thermal plant, cause the Lennox-to-Oshawa line won't available in time.

While he said it was not his "intention downgrade the role of public participa- n because there is obvious value in seking to identify major social and envi- nmental problem areas earlier rather an later," he noted that we should be are that planning for major facilities has en made more uncertain by the greatly tended lead times necessary to accom- date the greatly extended discussion es.

"We aggravate this uncertainty and gamble with reliability of supply if we indefinitely prolong discussions on sites and routes. I'm worried there's a widespread lack of appreciation for the very real supply problems we may face by failing to conclude public debate in time to construct needed facilities.

"If, in our efforts to involve the public in the decision-making process, we lose the ability to make timely decisions, we will not be serving the public interest," Mr. Timbrell said.

He paid tribute to Hydro's efforts to concur with a government directive to obtain a 10 per cent cut back in its administrative costs and to pare at least $1 billion from its capital expenditures up to 1985.

He said Hydro's decrease in capital expenditures was achieved by deferring by six months the in-service dates of all generating stations beginning with Bruce B.

However, he said, the second nuclear plant at the Bruce nuclear power development will proceed — on the delayed schedule.

"In addition to cutting planned administrative and capital expenditures, Hydro reduced its rate request for 1976 by almost five percentage points," said Mr. Timbrell. "This reduction in the rate request demonstrated Hydro's willingness to take measures judged necessary by the government to moderate the effect of a substantial electrical price increase upon the public during a time of rapid double-digit inflation."

He added that the government will remain sensitive to the impact of rising energy prices on the individual and on the economy of Ontario.

"We will do everything possible to minimize the impact of sudden increases in the price of energy. However, despite this commitment to cushion impacts over the long term, we must make it clear to the public that the days of cheap energy are gone," Mr. Timbrell said.

He noted that in the past 20 years electric energy prices have increased at a rate lower than that of the consumer price index. And the increases have been much less than the increases in the average weekly wage. Between 1954 and 1974, while the CPI rose by 84 per cent and industrial wages almost tripled, the average price per kilowatt-hour for electricity in the home increased by less than 25 per cent.

"This relationship will change. The hard fact is that we can expect to pay not only more in absolute terms, but more proportionately, for electricity as well as other energy sources.

"Put simply," Mr. Timbrell said, "it means that a larger portion of our pay cheques will be used to meet our energy needs."

Represent public or others will, lawyer warns

Shape up or ship out was the gist of the message delegates to the Ontario Municipal Electric Association's District 1 annual meeting got from their legal counsel.

Allan Schwartz, who represented the OMEA at hearings before the Ontario Energy Board into Ontario Hydro's applications for rate increases, cautioned the association that if it doesn't get out and represent the power consumers of the province before the OEB and the Porter Royal Commission into long-range planning of the power system, someone else will.

"And you'd better do it in a way that the public understands," Mr. Schwartz warned.

He said that as counsel for the OMEA one of the things that concerns him most is that groups like the Consumers' Association of Canada and the Association of Municipalities of Ontario feel they have to intervene before such hearings to represent the public interest.

"By implication they are telling the OMEA that it does no longer represent the public interest. We no longer do that. The question is what exactly are we doing?

"The OMEA has to take back that role of representing the power consumers of Ontario. And it must be taken back aggressively and with determination.

"And taking back that role won't be an easy job," Mr. Schwartz said.

He said there's no doubt that hearings in the future will encompass more than ever before — a broad spectrum of both social and economic issues.

"It will be incumbent upon the OMEA to deal with these issues realistically and in a way the public can understand. It's imperative the OMEA re-evaluate its positions and look with an open mind at the many suggestions that are going to come out in the next year or two.

"Some of these suggestions will be useful, and some will be useless and silly. But they all have to be looked at individually, each on its own merit. It's no longer good enough for a group like the OMEA to take broad policy positions and reject outright anything that appears not to fall into that pattern.

"If you continue to do that you will become an organization locked into the past and will have no future," Mr. Schwartz said.

Public expectations are changing and will continue to change, he said noting that the OMEA must change with it.

"The OMEA must provide the public with leadership and direction in matters of electrical distribution in this province. But it must do it with an understanding of public concerns. No longer is it sufficient for the OMEA to say we've always represented the public. No longer is it sufficient for us to say we know what's going on and they don't. Those answers are no longer acceptable," he said.

The 1976 OEB hearings into Ontario Hydro's bulk power rates will probably be the most important OEB hearing for several reasons, Mr. Schwartz said, the main one being that in 1974 the board ordered Hydro to look into the whole matter of rates.

Hydro, he said, embarked on an intensive project that's half-way over. Hydro will come to the 1976 hearings with a brand new set of rules that's going to propose rates based on methods the OMEA doesn't know about at present.

"Cost allocation will be approached from a different perspective — and at the 1975 hearings it was obvious intervenors were preparing for the 1976 hearings. Next year we'll be faced with an entire revamping of the whole area and for that reason we'll be faced with new things we've never seen before. But we'll have to deal with them.

"The OMEA, without any doubt, will have to become deeply involved with the Porter Commission, if the association is going to provide leadership in the area of electric energy distribution. And intervening isn't enough. There must be the same involvement as there is with the Ontario Energy Board.

"OMEA is in a better position than anyone else to represent the electrical customers of this province for it has the expertise and the interest.

"And if you don't do it, and do it in a way that the public understands, in a way that the public can lean back and say those guys from the OMEA are out there fighting for me, somebody else will.

"And if somebody else will do your fighting for you, in a few years there will be no more OMEA because you will have outlived your usefulness," Mr. Schwartz said.

Hydro director urges firm stand on ownership

With a minority government in the province, it has become absolutely necessary for the municipal electric utilities of Ontario to take a firm stand on the ownership of Ontario Hydro, says an OMEA member of Hydro's board of directors.

Douglas G. Hugill, a past president of the provincial association, and one of tw OMEA nominees to the Hydro board, tolc delegates to the District 1 annual meetin that the OMEA has always viewed Hydro as a municipal co-operative and conside its membership as the majority owners.

"In a minority government situation we must be more than ever vigilant and on guard against the possibility of Ontario Hydro being taken over as a department the provincial government," Mr. Hugill warned.

He said that at every Hydro board mee ing, time is the most important constraint facing the board members.

"Directors of Ontario Hydro are not rubber stamps for corporate policy and a open to persuasion if we can prevent vali arguments concerning proposed change

"Members of the board are continually faced with decisions on proposals by Hydro staff, endorsed by the corporate office, and accompanied by page-after-page of data to prove how necessary it is for the board to accept staff decisions.

"OMEA representatives have to be cor tinually alert to be able to fathom what effect each change will have on Hydro's majority stockholders — the municipalitie — to point out the flaws in the change anc to quickly try to get majority support for our position from the other board members," Mr. Hugill said.

He suggested the appointment of Dr. R. H. Hay to complete the unexpired term of OMEA nominee Andrew Frame (who resigned to accept a senior advisory position with the Ministry of Energy) was the "best possible choice to represent th municipalities on the Hydro Board.

"Dr. Hay is the architect of the present wer costing system, the most articulate okesman for the municipalities, and by ining and experience is able to discuss chnical problems on the same level as nior Hydro people," Mr. Hugill said.

Mr. Hugill suggested that municipal lities must become more involved with e OMEA to strengthen the association's sition within Hydro.

"Too many commissioners," he said, ve been standing on the sidelines while ers in the OMEA are trying hard to nd up and be counted."

And he suggested that the OMEA be nfident and sure of itself and what it nds for. "Be sure you (as individual mbers) represent your municipality and portion of ownership in Ontario Hydro. He urged co-operation between Hydro d the municipal utilities.

"During the past, Ontario Hydro could d did count on the co-operation of the EA. particularly in the political arena. o doing we were able to keep Hydro of politics.

However, in the last few years increased ssure has been exerted on Hydro and it become the favorite whipping boy of politicians. One would think that this ation would draw the OMEA and ario Hydro closer together, but such ot the case," Mr. Hugill said.

nd he lashed out at local Hydro com-sioners who have been quoted publicly eing opposed to any increase in Hydro s.

Do these people know what such a ement implies?" he asked.

nswering his own question, Mr. Hugill one has only to look at Consolidated son in New York to see what happens utility which allowed itself to go vily into debt because it would not — ould not — raise its rates to the er levels.

"For representatives of the owners to speak out like this — well I have to say they appear terribly ignorant of the power facts in Ontario. And if ignorance is contagious, they're exposing everyone around them," Mr. Hugill concluded.

Panel disputes existence of energy policy

Governments should stay out of the energy business, says W. O. Twaits, retired chairman of the board of Imperial Oil Ltd.

One of five panelists appointed to thrash out the question of whether Canada has an energy policy or not, Mr. Twaits said energy, like food, is too important to be left in the control of government.

And, in his opinion, the nation has no energy policy.

"I don't believe," Mr. Twaits said, "that Canadians would wish to place their reliance for supplies of gasoline and heating oil on some government institution which has amongst other things, been unable to deliver the mail in a single postal region; introduced the Egg Marketing Board at the expense of local consumers; suffered crippling strikes in the public service at great economic cost and discomfiture to Canadian citizens."

Mr. Twaits suggested there is no such thing as an "energy policy." He said that instead, the supply of energy "must reflect a blend of many policies which would include a co-ordination of all fiscal, monetary and trade policies to encourage the development of all indigenous sources of energy ranked in economic order with critical recognition of the long lead times involved.

"This applies to Canada where we use 300 million BTUs per capita of energy a year in all energy forms, or to India which uses only 12 million BTUs per capita a year.

"In direct contrast, the actual policies in Canada in recent years have demonstrated a positive genius for inhibiting the development of new energy sources while encouraging the wasteful use of existing resources," Mr. Twaits said.

He noted that energy has been so cheap there has been no incentive to improve efficiency of use.

"Indeed, our automobiles, our houses, our factories, and our office buildings have had no conservation considerations in their design or construction. Even our utility rates structures in gas and electricity decrease according to volume and I don't have to remind anyone in this audience that the design of electrical appliances was based on cheap power," he said.

Mr. Twaits charged that petroleum development in western Canada might have been delayed for another decade or more if the final test in a long string of dry holes had not found oil in commercial quantities in the Devonian reef at Leduc.

"The Leduc well, indeed, would never have been drilled if the business environment in Canada had not been venture-oriented. The tax and royalty rates were based on providing an incentive to risk capital and risk technology.

"The list of deterrents to additional petroleum supply in Canada today is almost unbelievable. While we're debating the possible shortages and the balance of payments problem, which increased reliance on imports will create, Canadian policymakers created obstacles to indigenous petroleum development such as:

- Federal price controls at levels substantially below world prices and mo importantly, substantially below those necessary to develop frontier areas, ta sands, heavy oil deposits and the like;
- Provincial price controls at levels belo the federal rate in a number of provinces, followed by a price freeze under which suppliers are forced to sell their product at an out-of-pocket loss;

■ Confiscatory taxation as a result of the great federal-provincial battle over revenues which has been only partly resolved and in which the petroleum industry, and ultimately the Canadian economy, are innocent victims;
■ A frustrating delay, now more than four years old, in proclaiming new federal regulations with respect to development of frontier and off-shore areas;
■ Discouragement of urgently needed stimulants for improved energy efficiency, not only through price controls but also by failure to reduce highway speed limits;
■ The procedural delay and political vacillation on the Mackenzie river pipeline system;
■ The tar sands debacle, and general bureaucratic interference at various levels of government.

"The era of cheap energy is over — there are no magic break-throughs to breeder reactors, solar energy, electric cars. There is no pool of low-cost hydro-electric development.

"Energy costs are going to double or triple and we will have to adjust to energy economies and the designation of a large piece of the economic pie to its supply.

"And the price of energy, whether it be oil, gas, or electric power must be sufficient to develop new supplies. Inventory profits are a political myth because they are never realized until you liquidate the business. Yet they are taxed with a severe impact on cash flow to the industries involved," Mr. Twaits said.

Ontario's deputy minister of energy, R. M. Dillon, said he couldn't hope to convince any doubters if indeed Canada (or Ontario) did have an energy policy or not.

"What is an energy policy?" Mr. Dillon asked.

He pointed out that in Ontario there's the Energy Act, the Ontario Energy Board Act, the Ontario Hydro Corporation Act and the Ontario Energy Corporation Act, the latter which enables the government to become involved with industry and other governments to ensure an adequate supply of energy for the province.

Mr. Dillon said that Ottawa and Ontario are working closely to ensure there's an adequate supply of uranium for the nation's nuclear reactors before export guidelines are set.

And he said that Ontario has invested $100 million in the Alberta tar sands project to ensure there's an adequate supply of oil for the province. "The Athabaska oil sands is an immense project and must keep going if our needs for oil are to be met," Mr. Dillon said.

He also pointed out there's an Ontario Royal Commission looking into petroleum pricing and another looking into long-range planning of the province's electric power system.

"The question that concerns me is, is this really effective or is it counter-productive? I'd be the first to admit that much of it is counter-productive. So the question I leave with you is: do we have an energy policy?" Mr. Dillon said.

Bruce F. Wilson, former president of Union Gas, of Chatham, suggested an energy policy should be an effective plan for meeting the nation's energy needs now and in the foreseeable future.

And he said Canada lacked one.

"One of the principal recommendations of the Borden Commission was that natural gas should not be exported unless there was clearly a surplus.

"In the 1960s gas was meeting 20 per cent of Canada's energy needs. In 1973 it was meeting 23 per cent of these needs, while 45 per cent of Canadian production was exported to the U.S. and the remainder sold to domestic markets.

"The estimated 900-year supply of oil we're supposed to have and the 400-year supply of gas, unfortunately is not so.

"And the OPEC pricing cartel has led to a huge increase in the price of petroleum products in Canada — for reasons which escape me.

"There's no room for complacency — we're faced with oil and natural gas shortages in Canada. Our domestic demands and exports exceed our deliverability.

"Whatever policies Canada has had have not worked because governments have spent too much time fighting among themselves," Mr. Wilson said.

A senior advisor on coal to the federal Department of Energy, Mines and Resources, E. D. Jamieson, suggested coal plays a small part of Canada's energy policies, but a larger part of Ontario's.

As far as his group was concerned, he said, Canada does not have a coal policy "but we're working on it."

He said any energy policy from a coal point of view is out of date within a few months of when it was drafted and he blamed competition between U.S. industries and utilities for it.

Dr. C. H. Millar, Atomic Energy of Canada Limited's director of advanced projects and reactor physics, said he thought Canada had an energy policy.

But he said government policy on the development of nuclear power systems is less explicit than it is for development of energy resource materials.

Blind opposition to rate proposals called pointless

There is no point in setting up blind opposition to Ontario Hydro's proposals on the matter of rate increases or expanded facilities — regardless of who you are — or what you represent, says Ontario Municipal Electric Association president Alan B. Cousins.

Speaking at the fall round of OMEA annual meetings in Districts 1, 7 and 8, Mr. Cousins said that the conflicts that arise as various organized groups seek to press their views forwards on governments and government agencies can be illustrated in many ways.

"For example," he said, "the Toronto
ar carried a lead editorial July 19 entitled
It Wise To Spend More On Hydro?' and
nt on to make a case that it would not
wise.

"But it is also necessary to ask the
estion 'Is It Wise To Spend Less on
dro?' There is a case to be made for
t too.

"There is every reason to believe that
e Ontario government's decision to cut
Ontario Hydro's capital program by $1
lion could undermine the energy
curity of this province," Mr. Cousins
arged.

He added, "it has been suggested by
me concerned citizens' groups that the
cing of transmission lines be impeded.
another situation a housewife has pro-
sed organizing a massive switch off —
itch on at given times to seriously affect
dro's ability to serve.

Both of these actions can of course
ly result in increased costs and are not
eful in the fight to keep costs under
ntrol.

"There is no point in setting up blind
position to Ontario Hydro's proposals
the matter of rate increases or expanded
ilities regardless of who you are or
at you represent," Mr. Cousins said.

He suggested what would be more
pful would be a "more realistic attitude
the part of the public and of our
itical leaders."

And he said he was "deeply concerned
t the 37 to 40 members of a group
own as the Association of Major Power
nsumers in Ontario should attempt to
present themselves as another whole-
e function within the power distribution
tem of Ontario and seek unto them-
ves special privileges not available
thers.

"Over the past two years," Mr. Cousins
rged, "there are many examples of the
-serving attitudes of this particular
up of industries presented by either
COH or AMPCO.

Throughout the hearings both in 1974
1975, there have been illustrations of
same motivation for this group. They claim unfair treatment yet they are purchasing interruptible power at a sizable discount."

And he pointed out there hasn't been an interruption in Class A interruptible power since 1971.

"The need for honesty is obvious. There is no question that the gigantic sums Ontario Hydro is asking for must give sensible people reason to pause and to demand an independent and critical examination of the factors involved.

"And that is precisely what was attempted in front of the OEB — scarcely any facet of inflation except taxation would be as universally felt as power prices — but conversely the impact of increases in the cost of power may not be anywhere near as great as many people believe," Mr. Cousins said.

He said the important point about municipal control of electrical distribution is that the individual citizen not only can inform himself about increasingly complex trade-offs involved in conflicts between energy and the environment, but through local commissions he can participate in making decisions which affect him.

"Municipal control may be difficult to explain as a benefit other than dollars-and-cents savings in lower electric rates. It could be that in today's comparatively affluent society the public is less concerned with the savings reflected in lower electric bills that it was a few years ago.

"It does appear, however, that the opportunity to influence such institutions as utilities has become more precious in our increasingly complex society," Mr. Cousins said.

Coal main factor in proposal for rate increase

The main factor in Ontario Hydro's proposed 1976 rate increase is the cost of coal, says George Currie, general manager — regions and marketing.

Speaking at the annual meetings of OMEA District 1, 7 and 8, Mr. Currie said that while the main factor is the increased cost of coal, he also saw increases in fixed charges, interest and depreciation as significant.

However, Mr. Currie pointed out a comparison of rates charged by other utilities shows that "Ontarians are not being too badly treated compared with the rest of Canada.

"And certainly they're better off than residents of major cities in the U.S.," he said.

Mr. Currie said the reduction from Hydro's original 29.7 per cent increase proposal to 25.1 per cent is at the expense of the system expansion charge.

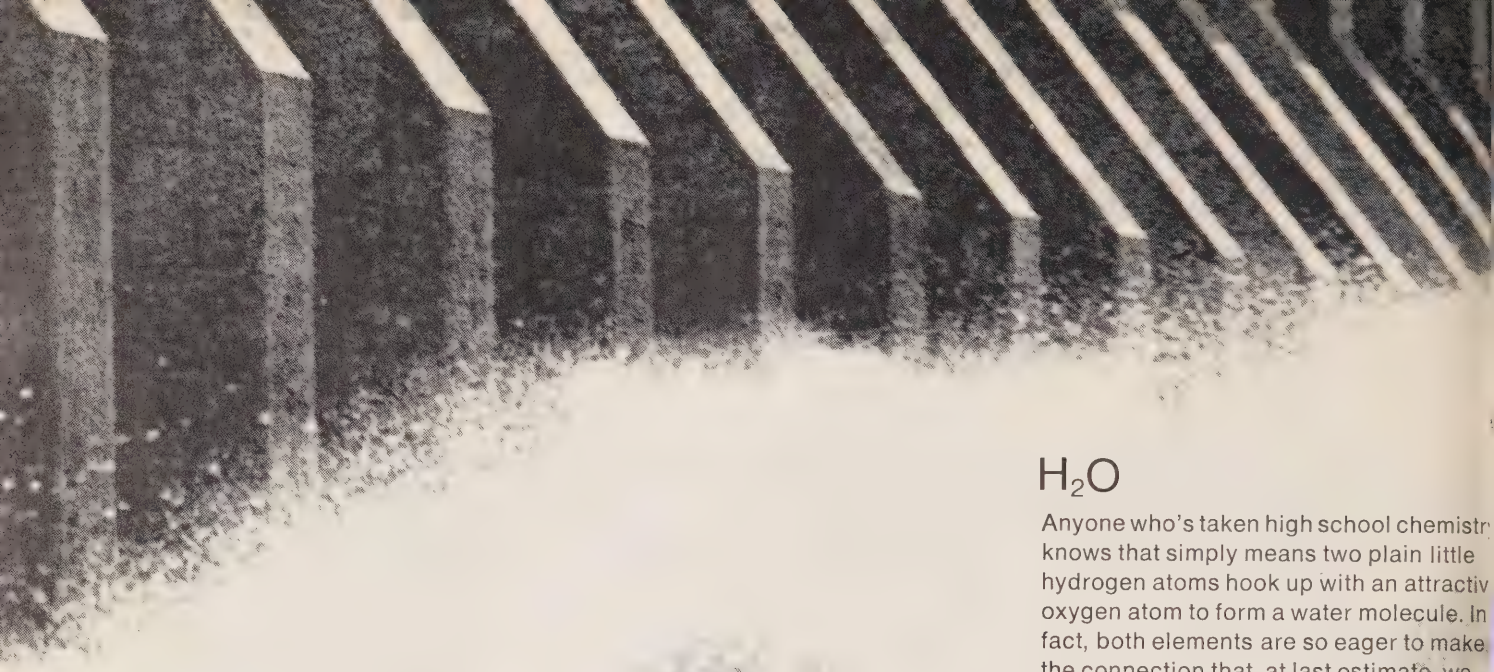
But, Mr. Currie pointed out that Hydro today enjoys an unrivalled credit standing.

"With the borrowing program we see ahead of us, it's more important now to the electricity consumers of this province than it ever was to ensure this credit standing is maintained, and that Ontario Hydro does nothing to jeopardize the provincial guarantee. (Ontario Hydro bonds are guaranteed by the province, which issues them on behalf of the Corporation in the United States.)

"Our current financial policy was designed to achieve that objective. That policy requires, however, that today's customers pay more for their energy now, so that they can be sure of energy in the future.

"That policy also provides for the lowest long-term cost of power," Mr. Currie said.

"And," he added, "in these inflationary times it is seldom popular to advocate measures which cost more now for some future benefit or indeed to preserve an existing benefit into the future. But this we must do, and we invite your support in getting the message through to the people of Ontario." □



The curious properties of water

by Dale Johnson

H_2O

Anyone who's taken high school chemistr knows that simply means two plain little hydrogen atoms hook up with an attractiv oxygen atom to form a water molecule. In fact, both elements are so eager to make the connection that, at last estimate, we had 326 million cubic miles of the stuff here on earth.

If it could somehow all be stacked up over Canada's area of 3.85 million square miles at one time, we'd be swamped unde a water tower 85 miles high.

Yet, despite the world's wealth of wate the U.S. government as a Bicentennial exercise, has just spent $2 billion in a lavish attempt to see if scientists can possibly find a few drops of water on Mar

Looping through the solar system on ar 11-month, 500-million-mile chase, the firs of twin Viking space probes is scheduled to touch down on the red planet — hardly by coincidence — on July 4, 1976. (Latest calculations say the probe will miss by a day or two.) The second automated Viking laboratory is expected to land two months later to search for water 1,000 miles north east of the first site, a place where occasional signs of water vapor have been detected.

A project scientist has said the $2 billion mission will have been justified "if Viking comes back with one answer — the answer to the question of water on Mars."

Why a $2 billion search for something that dribbles annoyingly out of any leaky bathroom faucet back home?

Life on earth was conceived in the primeval oceans, and water continues to support all life here. A few very simple organisms can live without air. No organism known to biologists can grow without water.

The programmed Viking biological experiments assume that Martian organisms — if there are any now, or ever have been any — would depend on water as all earth organisms do.

Odorless, colorless and tasteless, ordinary water is one of the most extraordinary substances known to science.



Over hundreds of millions of years, water has shaped and reshaped the earth's face. Frozen glaciers have chiseled vast depressions and lake beds in the landscape, changed river courses, and hurled millions of tons of soil and boulders hundreds of miles from their place of origin.

Rain and flowing streams level mighty mountains, gouge out canyons, create broad valleys and wear away the hardest rocks. Pounding surf and lapping waves gnaw constantly at coastlines, transforming the profiles of continents.

After grinding out the soil for crops and trees, water interactions determine the climate in which they thrive or wither. It is an essential in almost all manufacturing processes, from baking a loaf of bread to building computers that guide Viking probes to search for water droplets on Mars.

Electric power based on water — either in the form of steam in fossil-fuelled and nuclear-electric stations or as liquid in hydro-electric plants — drives modern technology and will play an increasingly important role in our energy future.

Ontario Hydro, of course, comes by its name from its original harnessing of water power that still provides about 40 per cent of the system's generating capacity.

Chemically, water is a unique compound of great stability, a powerful source of chemical and nuclear energy, and a most remarkable solvent.

Ancient alchemists searching for the "universal solvent" ignored their bath water. Water dissolves almost every substance on earth, in trace amounts at least, so that absolutely "pure" water is a laboratory curiosity. About half the 92 natural elements can be identified in any cup of seawater. Next time you take a sip of water, you will undoubtedly imbibe a number of glass molecules from the tumbler you lifted to your lips.

Rain, as it condenses and falls, dissolves atmospheric gases and airborne impurities. After it lands, it dissolves other substances. Every gulp you take is an aqueous solution of something or other — perhaps including gold, but mostly things you'd rather not know about.

So benign that all diversified life forms thrive in it, water is so corrosive that in time it will disintegrate the toughest metal.

Physically, water happily defies the law of gravity by regularly flowing uphill through narrow passages by "capillary action" to nourish plants. It blithely ignores a dozen other scientific laws that other substances follow slavishly.

Water molecules tend to draw away from many organic substances, but are strongly attracted to most inorganic materials — including themselves. Two water molecules can cling together with a tenacity rivalling that of structural steel.

Even the temperatures at which water freezes and boils are out of step with the pattern set by similar compounds. Most related substances boil and freeze at scientifically predictable temperatures, in an orderly and well-understood progression associated with their molecular weights.

Of four compounds which are chemically closely related, water is the lightest. It should have the lowest boiling and freezing points of the family, and the narrowest range between these two points.

Water's closest relatives, and their freezing and boiling points, are: hydrogen tellerium, —15°C and —5.5°C; hydrogen selenium, —72°C and —41°C; and hydrogen sulphide, —82°C and —60°C.

If water followed the tradition set by its relatives, it would freeze at —100°C, and boil at —80°C. There would be no liquid water on earth. Only steam.

Ignoring all scientific theory, water's freezing and boiling points are not the lowest but the highest in the family, and the range between them is the broadest — from 0°C to 100°C. No one knows why.

Even in a laboratory, if you cleverly managed to isolate "pure" water, then succeeded briefly in balking its urge to dissolve anything it came in contact with, you would still have a tremendously complex mixture.

There are, in fact, 33 different *kinds* of water, all of them more or less covered by that simplistic H_2O formula, and all of them switching costumes at a millionth of a second's notice.

H_2O merely specifies two atoms of hydrogen linked with one atom of oxygen.

But, there are three kinds of hydrogen atoms — isotopes that are *chemically* identical but *physically* different.

Ordinary hydrogen, simplest element in the universe, consists of a single electron revolving around a single proton. Its first isotope, deuterium, has a heavy neutron parked inside the nucleus with the proton — excellent in the form of heavy water for moderating Candu reactors. (See The Mating Game, Hydro News, January-February, 1975.)

Its second isotope, tritium, has two neutrons in the centre — making it radioactive.

Not to be outdone, oxygen has three isotopes too — with atomic weights of 16, 17, and 18.

So, the six isotopes can combine in 18 different possible partnership arrangements.

Then, water being such a dandy solvent, it can even dissolve itself. This means that split-up fragments of water molecules, or electrically-charged ions, are always floating around in the "pure" water. This floating debris consists of the three types of hydrogen ions (positively charged), the three types of oxygen ions (double negative charges), and nine types of hydroxyl ions (temporary couplings of single hydrogen and oxygen atoms, with a negative charge).

That means 15 possible "ionic solutions" on top of 18 possible "isotopic variations", for a total of 33 possible kinds of water. But, all of them very "pure".

Many of water's oddities, including its strange ability to climb hundreds of feet upward by "capillary action" through

narrow passages against the pull of gravity, and its astonishing capacity for dissolving things (10 pounds of water can dissolve 87 pounds of ammonium nitrate fertilizer), can be traced to the peculiar way its two hydrogen atoms link up with their oxygen friend.

The connection, made by consenting outer electrons of the atoms, is a particularly strong tie called a "covalent bond".

Every hydrogen atom has a single "shell" around its nucleus — a kind of boarding house with rooms for two tenant electrons, but occupied by only one, which is all its central proton can attract electrically. Comparatively speaking, oxygen is a small apartment house with an outer shell built to accommodate eight electrons, but occupied by only six.

Filled atomic shells are stable, their occupants firmly resisting any urge to roam. But vacancies are as unstable in the atomic world as they are uneconomic to a landlord. Energetic but "unbound" electrons, rattling from room to room, are precariously held. They like to wander, mix, meet, and perhaps enter into more satisfactory housing arrangements. In the modern idiom, they are "swingles".

A thoughtful landlady, nature rearranges the three structures under one molecular roof, allows the restless hydrogen electrons visiting privileges in the oxygen shell, and vice versa. This kind of group commune endows the water molecule with remarkable stability — and there is just no use moralizing.

The shared dormitory arrangement, however, produces a lopsided structure, with the pair of hydrogen atoms stuck like rabbit ears on one side of the oxygen molecule at a 105-degree angle to each other.

One effect is unbalanced electric charges in the molecule. With its hydrogen annex positively charged and its oxygen end negatively charged the molecule becomes a "dipole", the electrical equivalent of a bar magnet.

The positively-charged end of the water molecule tends to grab any negatively-charged particle in its vicinity, and the negative end does the same to any positive charges around. If the passing charges were formerly busy holding the molecule of some substance together — sodium chloride (table salt) for example — the water molecule just levers them apart and the substance is "dissolved".

This same dipole effect is involved in water's ability to creep 500 feet up through tiny capillaries in a tree trunk to nourish the topmost leaves of a California redwood.

The water molecule's hydrogen rabbit ears will bind themselves temporarily to a variety of substances, especially any solid that has oxygen in it.

Confined in any tiny passageway, the foremost molecules on the edge of the water surface grope above them for any oxygen atom in molecules of the wall. If they find one, they grasp it and draw themselves toward it, dragging a whole chain of tightly-linked water molecules along behind. All hydrogen links then switch grips and repeat the process.

Water's most important oddity is often overlooked because it is so simple. Ice floats. By all rules of physics, it shouldn't.

Almost every material, solid, liquid or gas, shrinks in volume as the temperature goes down, growing more dense and thus heavier. Water follows this rule faithfully down the thermometer until it reaches 4°C. Then it rebels, starts to expand and gets lighter as the molecules rearrange themselves to go into a pecularily airy crystalline form. When it solidifies into ice, it continues to expand until it has gained about 9 per cent in volume.

That's the reason water pipes burst after a sudden freeze. It is also the chief reason life was able to evolve on earth.

If water behaved like other freezing liquids, it would sink to the bottom of lakes and rivers, and build up from there. Before long, the water would be irrevocably locked on the beds of seas, lakes and rivers in eternal ice, covered only by thin layers of liquid water melted during the warmest seasons. As it is, when winter ice forms and floats on the surface of bodies of water, it forms an insulating skin protecting the liquid beneath it from further freezing.

Think what would happen if the Niagara River froze solid on a winter's day when power demands reach their peak. A protective ice boom installed each winter at the mouth of the river has been notably successful in stabilizing the Lake Erie ice sheet and preventing ice jams from restricting output of Niagara power plants

New and homey little facts about water are forever being discovered and rediscovered.

Some time ago, a college professor arrived home to find his wife putting warm water in the ice trays to make cubes for his cocktail hour.

Parched and impatient, the professor snapped that while she might be the most beautiful of earth's creatures, she obviously wasn't the brightest. Otherwise she'd know cold water froze faster than warm water.

She snapped back that obviously he'd never been a housewife, because any housewife knew better.

To prove her wrong, he put in a second tray filled with cold water. His wife's ice cubes were ready in time to chill the martinis. His tray was still full of water.

Baffled, he experimented for days in the college lab and painstakingly quantified this strange phenomenon. Using a range of water temperatures from 8°C to 36°C, he found that ice cubes formed fastest when placed in the lab freezer at exactly 22°C.

He was about to write a learned paper for scientific journals, and in fact announced it publicly, when a student pointed out that frost crystals are exceedingly poor conductors of heat, and inevitably form over freezer shelves due to vapor condensed from the air. The warm water tray melted the insulating frost layer giving metal-to-metal contact and good heat transfer efficiency.

At least one of water's many mysteries had been resolved. □



CNA Seminar

Public's right to know stressed by AECB head

The Atomic Energy Control Board plans tighter regulation of nuclear power plants, stricter security guidelines to thwart terrorists, and broader supervision of uranium mining and radioactive wastes.

In an address to a Canadian Nuclear Association seminar on Public Concern and Nuclear Energy, Dr. A. T. Prince, president of the AECB, also forecast a wider role for Canada's regulatory authority in communications and responsiveness to the public, and in "mission-oriented research and development in support of our licensing efforts."

The AECB issues licences to build and operate power plants and other nuclear facilities.

Two nuclear critics representing Energy Probe and the Cantdu group took part in the Etobicoke seminar, which was designed to help CNA member organizations to improve their effectiveness in communicating with the public. Two of the issues raised were alleged incompetency of regulatory groups and secrecy.

Dr. Prince described competence as "a prime component of the confidence level maintained by any regulatory agency. We have developed through the years a small but highly competent staff and we are endeavoring to further expand and develop that competence."

Dr. Prince, who was appointed head of the AECB last February, said "regulatory

effectiveness is dependent on public awareness of, and understanding of the regulatory process. To this end, we must investigate ways and means of more effective public information programs and opportunities for the public to express its views.

"We must be sensitive and responsive to the social impacts of our actions and to the needs of all Canadians, including anti- or pro- nuclear advocates, atomic radiation workers, applicants, licensees, and concerned citizens."

Dr. Prince described communication as "an extremely important aspect of the level of public confidence which a regulatory agency may enjoy."

"We must clearly recognize that regulatory matters, whether nuclear or otherwise, are the public's business, and that the public has a right to full, objective and timely information . . .

"A well-informed public will help us to achieve a more effective regulatory system and the best level of compliance performance."

Calling for communication "with openness and candor," Dr. Prince said "we must make a strong effort to have justice done and to have justice seen to be done."

Dr. Prince said "a reasonable balance must be found between responding to public concern and meeting the public's needs for energy — and between dangers of information obstructionism on the one hand and tactics of bulldozing through nuclear developments on the other.

"The AECB does not promote, it regulates and controls — we say how and under what conditions nuclear energy may be used if others make that choice as their energy source."

Dr. Prince told the seminar, which was attended by more than 100 representatives of the nuclear industry, that all of them had a responsibility to respond to public concerns about nuclear energy and urged "free and reasoned communication among the public, the news media, the nuclear industry and the regulatory authority."

Opening the seminar, CNA president C. A. Dagenais said the industry is making increasing efforts to deal openly with the public, the media and special interest groups.

"We cannot and should not take the attitude that people should leave nuclear energy policies and decisions in the hands of those who know best, that is, the government or the scientists or the engineers.

"They have a right to know what may affect their lives and it is up to us to provide reliable information for them to come to their own conclusions."

William Peden, executive director of Energy Probe, alleged there was "a great deal of incompetency" in the over-all management of nuclear power, not at the engineering level but at the government and regulatory levels.

He cited hazards to uranium miners at Elliot Lake and dumping of radioactive wastes near a Port Hope refinery and charged that nothing was done about it. "That scares the public," he said.

Mr. Peden said there was "a great deal of secrecy and cover-up" over nuclear power. He was later challenged on this point by a member of the audience, Derry Ironside of Ontario Hydro, who said that in one instance the information requested by Energy Probe on radioactive emissions at Pickering generating station was on computer tapes at the time. It was later made available in a written report.

Mr. Peden, who said Energy Probe isn't an anti-nuclear group, favored growth in the use of wind and solar technologies. Energy Probe opposes energy-intensive industries and life-styles and generally favors lower environmental impact, new ways of using scarce resources, and "helping the third world."

Paul Caroll, vice-principal of Seaforth Public School, warned that the Goderich-based Cantdu group is "not a noisy, vocal minority that's going to go away" and called for "a moratorium on further construction of nuclear power plants until uncertainties are clarified and settled."

He said Cantdu concerns included possible health effects, radioactive waste management, emergency cooling systems, power demands, conservation and costs. He urged funds and expertise be used to support alternate methods of energy production.

The nuclear critics were members of a panel, which included spokesmen for Environment Canada, the nuclear industr and the media.

J. A. L. Robertson of Atomic Energy of Canada Limited said "energy, besides being a staple itself, is an essential component of any solution to most other majo issues: securing enough food, reducing pollution, winning raw materials, reducin economic disparities and reducing international tensions."

Nuclear energy is *one* of the major energy sources, he said. "It is unique in offering immediate substitution for scarc oil and gas combined with long-term security of energy supplies. Specifically, we advocate the Candu system as a proven and acceptable means of fulfilling this nuclear promise."

Availability of sufficient uranium fuel is a "legitimate issue," he said, pointing out there is controversy over whether renewe exploration will uncover vast resources. However, he said Candu reactors using a thorium fuel cycle could economically us low grade fuel deposits that are adequate for centuries.

Pointing out that spent fuel is being stored safely now, he predicted that withi 25 to 50 years spent uranium fuel will be contained and isolated in stable geologic formations. Laboratory work is being performed to ensure that plutonium can b safely recycled in Candu reactors when justified economically, he said.

Emphasizing that risks from nuclear power plants are "very low," he said that "in the face of national and world needs for energy the far greater risk would be doing nothing."

Dr. R. R. Logie of Environment Canada called for research into the effects of sma doses of radioactivity on people and on the food chain, and disposal of waste heat from reactors. He also urged efforts to bridge the gap between federal and provincial responsibilities in the nuclear field.

Lydia Dotto, a Globe and Mail science riter, called for "candor and honesty, articularly when things are going wrong." ne said that covering up and trying to de things almost never works and does finitely more damage than the problem self does.

Earlier, John Davies, manager of ntario Hydro's public attitude research epartment, reviewed public views about uclear power revealed in surveys under- ken for a proposed nuclear station on e north shore of Lake Huron. "Although ere is a very large base of public upport," he said, "there is opposition ere and it is growing."

Surveys of two areas showed that news- pers and television stations were the ajor sources of information and sug- ested the media should be treated as a ublic itself. He urged more research to oid "going up blind alleys with equally lind public information programs."

"It appears that we have now reached a oint where the concerns of society and ublic attitudes to nuclear power have come an important factor in planning r future nuclear developments," he said. "hey have a measurable effect on sche- ling, cost and engineering efficiency.

"In this situation, the relationship tween the industry and the public is itical. A new phase has begun and izen attitudes to relevant issues have to taken into account by the nuclear dustry, particularly by utility members..."

The importance of information media vas also stressed by Carl Goldstein, ssistant vice-president of the U.S. Atomic dustrial Forum, who suggested steps avoid controversies over nuclear power at have erupted across the border.

He urged respect for the right of the blic to have "some say" in nuclear cisions and respect for the sincerity of tics. "Tell the public what it wants to ow about nuclear matters," he said. ive them facts and explanations in a y that is understandable and meaning- to them."

During the afternoon session, Sam rton, project manager of Bruce Nuclear Power Development, discussed the extent of community involvement in deciding on grants made by Ontario Hydro to cushion the financial impact on area municipalities. He said the plan, drawn up with the co-operation of municipal representatives, is now being implemented and was "well received."

"It doesn't result in nearly as much money as some municipalities were suggesting two years ago but they have been part of the process and they see it to be fair treatment," he said.

A second panel discussion, moderated by former Hydro chairman George Gathercole, dealt with public, government and industry involvement in nuclear power.

R. M. Dillon, Ontario's deputy minister of energy, said the government's concerns were environmental impact, financing, security of energy supply and resolving the nuclear controversy.

Mr. Dillon said "Ontario Hydro has consistently had the backing of the provincial government and, in great measure, the provincial legislature for its plans to build nuclear stations as a principal means from which to meet the increasing demands for power." But he said questions had been raised about whether the original decision was valid, nuclear safety and possible alternatives.

He said a "thorough review and full debate in public of all the issues" was necessary because of "apprehension and misunderstanding on the part of some and in other cases outright disagreement or opposition."

He said the Royal Commission on Electric Power Planning headed by Dr. Arthur Porter will consider the nuclear program although its broad terms of reference deal with what the entire power system should look like 20 years from now.

"The establishment of the need for electricity and the role that nuclear power can play is, in my view, a key factor in public acceptance of any nuclear program," he said.

Later, referring to the recent Harris poll conducted in the U.S. showing 63 per cent in favor of nuclear power, Mr. Dillon said during a question-and-answer period that he thought a similar study should be done in Ontario.

What happens if a majority approves nuclear power here? "As long as there is an objector who can convince enough people that he's right, he carries the day, I guess," he said.

Other members of the panel were Desmond M. Connor, a consulting sociologist for public participation programs in Ontario; Dr. T. S. Thompson, assistant director — nuclear power, New Brunswick Electric Power Commission; Mayor George Ashe of Pickering, and Hal Jones of the CBC.

Summing up, CNA past president J. M. Douglas said "genuine concerns" had been identified but he thought fair-minded people could find solutions to problems.

"It will become apparent in a few years in Canada that we face a serious energy shortage," he said. Electricity will gradually replace other forms of energy and he urged "reasonable conservation programs."

He said other methods of producing energy "must be explored and vigorously pushed," but for the rest of the century there is "no satisfactory alternative" to nuclear-electric power.

The CNA's next step will be an information program now being planned by its public affairs committee. □

The Old Lamplighter

Herb Bowerman has made his world a little brighte



by Rae Hopkins

His personnel card in the Owen Sound Public Utilities Commission's archives tells you little about Herbert Devere Bowerman, the utility's first employee who joined its staff on the day it was formed back on January 12, 1915.

The card, buried in a stock of others about four inches thick and held togethe with an elastic band, notes that Herb Bowerman retired on pension — $20 a month — November 1, 1937.

That was when he was 65.

Now he's 103 years old, and little is known about his activities — and antics – during his 35-year tenure with the utility, for none of the current crop of employees was even on its payroll when Herb Bowerman took his leave.

Except the name. And everyone in this thriving industrial community at the hub of Georgian Bay knows Owen Sound's elder statesman.

In fact, he was responsible for illuminating the town's streets before there wa even an electrical supply authority. He was a lamp-lighter.

Born just outside Meaford, young Herb Bowerman travelled the 18 miles to Owe Sound by horse and buggy to attend business college. His first job upon gradu ation was driving the horse-drawn hearse for the local undertaker.

But soon he was hired by a group of local businessmen who formed the Owen Sound Light Company and built a small hydro-electric generating station at Inglis Falls on the Sydenham River to supply power for four carbon arc lamps.

"But it was only an evening plant. I used to start up the generators just befor dusk so I could turn on the streetlights when it was dark," he said.

And his bright blue eyes sparkle when he tells you he used to show up at the plant a little early to catch a few "dandy" speckled trout in the flume before he set the generators spinning.

In the daytime he climbed the poles to change the carbon so the lamps would be ready for night-time illumination.

Despite his years, he's still alert, although his memory fails him at times.

ut he still has a full head of snow white air. His hearing's all but gone but he'll ive no part of a hearing aid.

There's a cane hanging by its crook on e vallance over his 78-year-old roomate's bed and he says with a wry smile at "that thing belongs to the old fellow the next bed." Mr. Bowerman walks aided and often helps push his cronies' heelchairs to the dining room and, as points out, "some of these older guys ed a lot of help — most of them are ungsters in their 80s."

Even though his memory "isn't what it ed to be," Mr. Bowerman recalls many ld, icy winters when he had to climb ppery poles to change the carbon to ake sure the lights would come on at ght. And he smiles when he tells of one rticular bad day when a resident called n in for a hot cup of coffee and sug- sted he stay down off that pole so he uldn't get hurt.

After finishing his coffee, he gently ggested to the person that if he didn't e a chance and get up there to change at carbon, the person would be the first call him out in the middle of the night ien going up the pole would be really ngerous.

He changed the carbon and the streetlight came on that blustery night.

And he recalls there were a lot of electical storms in the Owen Sound area ound the turn of the century and one in rticular when he took his aging grandther with him to the plant.

'The lightning was jumping around the electrical apparatus so much that the ld boy refused to ever come out with me ain," he recalls.

n later years, the waterpower plant s supplemented by a steam plant — and Hrb Bowerman began reading meters d trouble shooting on the system.

At one time Mr. Bowerman lived near th waterpower plant and his hours were rm dusk to midnight, but when he moved to town the hours of work were from 7 m. to 5 p.m. "and all those nights that ot called out."

Another part of his job was to turn the lights off in the main street stores at night to conserve electricity. That he did through switches on the outside of buildings.

During all the years he walked the streets of Owen Sound to keep the lights burning there were lots of incidents "and not all of them were funny — but some were." Sometimes he would get called out in the middle of the night to get the lights going when a few of the townsfolk were quaffing a few and couldn't find the bar.

One of his secrets to longevity, he says, is that he never drank tea or coffee and never used tobacco. "Once in a while in later life I'd have a horn of whiskey though."

That explains his son, Elgin (Bus), was a hollowed-out cow's horn that they used to fill with Scotch — nowadays, we'd call it a 40-ouncer.

But, for Herb Bowerman, retirement didn't come easy. At 65, he was too used to people, so after a couple of months at home unrest caught up with him and he took a job as a school crossing guard.

"I guess I caused so much trouble arresting everyone who didn't stop when I told them to that they took me off the job and instead gave me a job caretaking at the city hall." That lasted until he was over 70. Then he took a job as a watchman at a local electronics plant.

But he had to stop driving his car when he was 90 and was forced into involuntary retirement when his insurance company would no longer give him car insurance. Still he lived alone until he was 101 when he was the first resident to enter Lee Manor, the beautiful nursing home nestled at the foot of Owen Sound's east hill.

Life for Owen Sound's elder statesman wasn't all work though, although a great deal of it was. He was perhaps one of the best-known hunters in all the area. The story goes that if a fox ever came within rifle range of the grand old man of 95 while he was tramping the bush between Owen Sound and Meaford, it was a dead one.

In fact, 67-year-old Bus says that he'd spend a day in the bush with his father and when they returned home he'd be completely exhausted — but not dad. He'd clean the guns — read for a while — he's always been an avid reader — then sit down and watch a Saturday night hockey game on television. To this day he never misses a hockey game.

In all his years, Herb Bowerman has been in hospital but once — and that was when he was 99. He caught flu which turned into a touch of pneumonia, but so discontent was he that he insisted his son retrieve his clothes for him and he would walk home with him.

And even now despite his years, he's still a work addict. Indeed, when he was 95, his son heard the sound of an axe behind the family cottage and on investigation found his father taking out dead trees and chopping them into fireplace logs. He had to hide the axe to make him slow down.

And his favorite pastime now is to be taken for a ride to the family cottage "as long as we can get some work lined up there to get done."

Not long ago they held a 103rd birthday party for Herb Bowerman at Lee Manor. All of his family turned out including his "kid" sister, Mrs. Louise Morrison, who is 85, and all of the Owen Sound dignitaries.

But three years before that when they held his 100th birthday celebration, he promised he'd be around for at least three more of them.

He's repeated that promise this time, and who knows with the shape he's in and the keen sense of humor he possesses he's just likely to keep that promise.

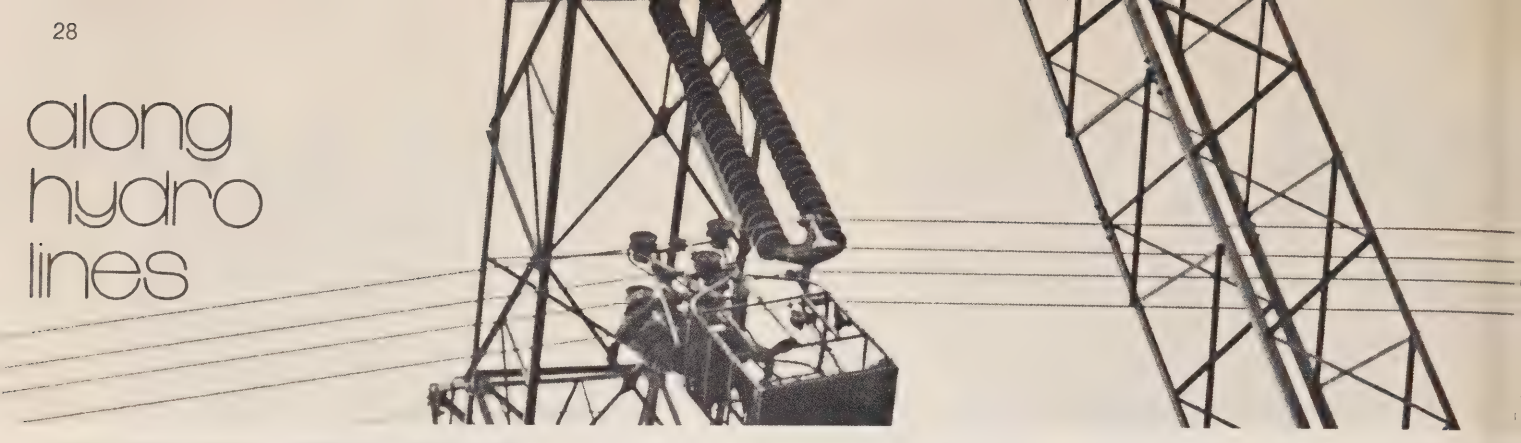
It could just be that back in 1946, when Charles Tobias, wrote these words to Nat Simon's music:

"He made the night a little brighter
Wherever he could go
The old lamp-lighter
Of long, long, ago."

he had someone like Herbert Devere Bowerman in mind.

Indeed he did. □

along hydro lines



Options are few

Ontario's energy options are few, says Energy Minister Dennis Timbrell.

Speaking to the Ontario Concrete Conference, Mr. Timbrell said in the first place "Ontario just doesn't have enough energy to carry on as lavishly as we have before — future supplies are tenuous. And energy is becoming too expensive."

He indicated it now appears the province will have to import greater quantities of oil at higher world prices "soon."

Natural gas supplies, he pointed out, are limited and the cost of producing electric power is increasing rapidly.

Mr. Timbrell said some studies have indicated that as much as 50 per cent of the energy produced is wasted. "With energy expenditures in Ontario this year likely to total $5.5 billion, the cost of wasted energy to the economy is immense."

Quest for uranium

Ontario Hydro has signed agreements with Shell Canada Limited, of Toronto, and AMOK Limited, Saskatoon, to jointly finance uranium exploration ventures as part of its program to ensure adequate supplies for the province's long-term nuclear power program.

And the utility has announced it intends to provide financial support for selected uranium exploration projects. Discussions are continuing with other companies.

Chairman Robert B. Taylor says it's Hydro's view that uranium exploration in Canada has been inadequate to assure that long-term domestic requirements can be met.

The pact with Shell will call for exploration work by the company over a five-year period, subject to extension. The program will involve joint expenditures in the order of $7 million during the initial period to explore areas in northern Ontario and the Keewatin district in the Northwest Territories.

The AMOK project calls for continuation of a portion of the French consortium's previous exploratory work near Cluff Lake, Saskatchewan, which resulted in the discovery of uranium deposits now being developed for production in 1978 and contemplates expenditures of about $2.5 million in the first three years of an accelerated search in the northern half of its claims group.

It's anticipated that both agreements will give Hydro not only its share of any uranium that may be found, but preferred rights to purchase uranium from the other participants' shares as well.

"These plans," Mr. Taylor says, "will not affect Hydro's requirements for major amounts of uranium from the known deposits of Canada. These remain essential to Ontario's nuclear program."

Hydro has existing contracts for the future supply of uranium totalling 8,616 short tons of U_3O_8 which will supply most of its requirements through 1980 and part of its needs through 1985.

Negotiations are continuing for additional quantities. Hydro estimates its nuclear reactors will require 75,500 short tons by 1995.

Mr. Taylor says recent and expected rises in the costs of fossil fuels tend to make nuclear plants more economic than coal or oil and estimated that about two-thirds of Hydro's new electrical resources will be nuclear.

"Studies indicate production capacity within Canada based on known uranium ore reserves will likely satisfy annual domestic demands over the next 15 years, but may not be enough to supply domestic needs in addition to export commitments before the end of that period.

"Construction of nuclear stations planned by Ontario Hydro and utilities in other provinces gives cause for concern that by 1990 production rates from deposits now known may not be enough to meet the demand. Uranium needs will then be increasing while production fr known deposits will be falling due to haustion of some ore bodies and declini grade in others," Mr. Taylor said.

He added that the need is for large n reserves to be discovered and brou into production in the next 10 to 15 ye in order to prevent a possible scarcity nuclear fuel for Canadian reactors.

Meanwhile, British, Spanish and Swi electrical utilities, together with two Car dian companies — Eldorado Nucle Limited and Conwest Exploration Limit — are planning a large-scale uranium e ploration venture in Saskatchewan, Qu bec, and possibly British Columbia.

A British utility spokesman says t venture would be "strictly for explorati with no contemplation of upgrading a ore found in Canada."

(See also Hunt for Uranium Heats U Hydro News, November-December 197

Mine regulations okayed

Alberta's Energy Resources Conservati Board has given regulatory approval for major coal mining development in t western part of the province — intended a future source of supplies for Ontar Hydro's coal-burning thermal-electr plants. *(See Rekindling Coal, Hydro New July/August 1975.)*

The board found the $65 million op pit mine proposal, with an annual capaci of 2.5 million tons, to be feasible and in t provincial public interest.

The proposal was put forward by Lusc Sterco Limited of Edmonton.

The Alberta cabinet will have to mal the final decision on whether the ventu will be allowed to proceed. According the original application, the mine is sche uled to be in production by mid-1977.

Coal would move by unit train Thunder Bay where a storage and tran shipment facility is to be built to distribu it to power plant locations around Ontari

Pressure on the Alberta government to approve this and other large-scale coal mining proposals is growing, chiefly because of the critical lead time needed to get individual projects into production within the timetable envisaged by Ontario Hydro to switch to alternative domestic supplies of boiler fuel from suppliers in the United States.

However, Alberta has yet to set a new royalty rate for coal production, now at 10 cents a ton, on the basis of its "full commodity value" or a price comparable to a competing fuel in the Ontario market.

Although the tentative price range has not been announced, plant gate prices are understood to be more than $20 a ton, or more than double the $11-a-ton price of only two years ago charged on similar types of coal.

Under the contract provisions Ontario Hydro is responsible for cost escalations beyond a certain limit in equipment and installation costs.

Senior citizens' rates

Senior citizens in six Maine communities will participate in an experimental program that will mean lower rates for electric energy for households with persons 62 years or older who qualify.

Under a bill sponosored by State Senator Bruce Reeves, about 4,000 households in Portland, Rockland, Bangor, Ellsworth, Caribou and Fort Kent will participate.

The bill provides for a three cents a kilowatt-hour charge for the first 500 kWh used in any month. Income limits for a single member household are $4,500 and $5,000 for a household with two or more.

The law requires that the state's public utilities commission administer the program. Guy Twombly, the utility's chief engineer, estimates the average basic rate for users participating in the program will be about $15 a month for the 500 low-cost kWh power. That's a saving of about $6 or $9 a month.

Island power

Hydro-Québec says it will spend $118 million over the next eight years on new installations on the Iles de la Madeleine, in the Gulf of St. Lawrence, 160 miles southeast of Gaspé.

About $26 million of the capital expansion will be allocated to the construction of a new thermal plant during the next three years.

The proposed plant has been deemed necessary to supply power to 14,000 islanders whose demand is expected to rise to 59 MW from its present 35 MW between 1978 and 1983.

Hydro-Québec says it will cost $118 million to extend its power grid in the area between 1978 and 1983.

"This is a considerable sum, but quite realistic when one takes into account the fact that demand for electricity on the islands is rising by 20 to 25 per cent annually, compared with about 10 per cent in other regions in the province," says a spokesman for the utility.

Manpower shortage hurts

Skilled manpower shortages could seriously affect Canada's economic expansion over the next decade, says George Howey, manager of Ontario Hydro's Nuclear Training Centre, at Rolphton, mid-way between Ottawa and North Bay in the upper Ottawa Valley.

Speaking to the Engineering Institute of Canada's annual congress in Winnipeg, Mr. Howey said "that economic expension will see large increases in capital investment and spending, primarily in energy-related projects.

"Changes will be needed in manpower planning, in training, and in immigration policy to overcome skilled labor shortages," Mr. Howey said.

He pointed out that one area of concern is the young people entering the labor force from our secondary school system. "Have they been properly informed through guidance and counselling of the projects and opportunities developing within Canada toward which they might move to eventual satisfactory employment?" he asked.

Mr. Howey said that although existing techniques are adequate for the more dedicated student for career selection, there still remains "a large contingent of less serious students whose interests lie outside the academic sphere and who must be motivated by new mechanisms.

"It's hardly any wonder that students experience difficulties in selecting a career. There exists no clear industrial policy for Canada and no central information agency that is aware of major projects and activities being planned and their implications for employment and career development," Mr. Howey said.

Odds favor nuclear safety

A U.S. government-sponsored study has reiterated in its final report that the risk of accidents from nuclear power plants is considerably lower than for other potential causes of death or injury.

The study for the Nuclear Regulatory Commission, which was headed by Norman Rasmussen, a professor at the Massachusetts Institute of Technology, reached the same conclusions as had a preliminary report by Mr. Rasmussen in August, 197

The study says that the chance per year of an individual being killed in a nuclear accident, assuming an industry total of 100 plants, is one in five billion. Currently there are 56 operating nuclear plants in the U.S. and the industry is expanding rapidly.

The nuclear accident risk compares with one chance in 2.5 million that an individual will be killed by a tornado or hurri-

cane and a one in 4,000 chance for death in an automobile accident.

Prof. Rasmussen said the study showed that non-nuclear accidents are about 10,000 times more likely to produce large numbers of fatalities than casualties caused by nuclear plants.

Prof. Rasmussen's study said the probability of a nuclear accident resulting in 10 or more fatalities was one in three million a plant a year. The largest nuclear accident considered in the study was 3,300 fatalities, with a probability of about one in a billion.

William Anders, chairman of the nuclear agency, says the report's conclusions reinforce the commission's view that nuclear plants provide "adequate protection to health and safety — and the environment."

Co-ordination a must

Many isolated government policies must be co-ordinated if Canada is to produce a dynamic energy policy to fulfill its long-term energy needs, says Calgary management consultant A. E. Pallister.

Speaking to the annual congress of the Engineering Institute of Canada in Winnipeg, Mr. Pallister suggested that the transition from an oil to an electronically-dominated era will require teamwork to balance the energy demands and the provision of supplies.

"Achievement of such a balance," he said, "will require a combination of policies involving less waste on one hand, and stimulation of the necessary investment capital, the natural resources and the manpower on the other hand."

He added that to form a "dynamic" national energy policy there must be co-ordination of federal and provincial policies on individual energy sources, of the needs of the producing companies and provinces with the needs of the consumers and provinces, of the roles between governments and industries, and of policies regarding alternative energy sources.

Gasification feasible

Coal gasification will become economically feasible as a means of synthetic petro-chemical feedstock within five years, says the Alberta Energy Resources Conservation Board.

Production of large volumes of substitute natural gas for commercial purposes to supplement conventional fuel could come about by the mid-1980s, says the board's report.

This first comprehensive official examination of technical and economic prospects for the gasification of some of Alberta's vast coal reserves—once thought to be a long-range development prospect —urges immediate intensification of provincial and private industry efforts.

The board has recommended the establishment of a pilot plant and a detailed inventory of suitable coal deposits to determine primary locations for gasification facilities.

Coal gasification is rapidly becoming a practical proposition because of the rising price of conventional natural gas, which until now has been the exclusive feedstock for Alberta petrochemical operations.

An average gasification plant producing 250 million cubic feet a day of commercial quality synthetic gas would require a mining operation with an annual capacity of eight million to 8.5 million tons.

There would be "three or four such plants in operation by the 1980s," says Norbert Berkowitz, a member of the board with special responsibilities for coal matters.

The board forecasts that coal prices, although on the increase for all types, will remain substantially below the wellhead price of conventional natural gas.

For instance, in 1980 the price of natural gas is expected to reach $2.10 a thousand cubic feet, while the price of coal to provide the equivalent heating value would be 50 cents. By 1990, conventional gas prices will have risen to more than $4 a thousand cubic feet, compared with 80 cents f coal on the same basis of comparison.

"We expect that coal will have an creasingly advantageous cost factor ov gas," Dr. Berkowitz says.

He suggests the capital cost of cc gasification facilities to produce supp mentary fuel supplies, along with the u cost of supplies, could be reduced appr ciably if governments were to participa in financing of these projects.

Meanwhile the Ontario government h encouraged TransCanada PipeLines Lim ed to continue with its plans to study th feasibility of using the Lurgi coal gasific tion process for producing synthetic g from coal, despite a recent setback dec sion from the National Energy Board.

Queen's Park has also expressed hop that the Canadian private sector will inve in the design, construction and operatic of coal gasification facilities of a comme cial scale in the near future.

County line gets okay

Ontario Hydro has been given the g ahead to proceed with additions to th electrical supply system for Prince Edwar county, in eastern Ontario, Energy Ministe Dennis Timbrell has announced.

The improvements involve constructio of a low-profile transformer station a Elmbrook, near Picton, and 14.5 miles c 230-kV transmission line between the ne station and the right-of-way connectin the switchyard at Lennox generating sta tion and Napanee transformer station.

"The additions to the system ar urgently needed to ensure adequate futur power supply for the region," Mr. Timbre said.

Picton town council, other municipa councils, the Quinte planning board an the Prince Edward county planning boar have all endorsed the approved transmis sion line route.

trengthen conservation bid

espite Canada's acceptance of the need conserve energy resources, it hasn't dopted policies strong enough to achieve goal, says a Toronto Star story based a confidential report prepared for the lternational Energy Agency.

Canada has adopted a sound conserva-n policy in the face of impending energy ortages, the report says, but hasn't cked the general policy with strong ecific measures.

"One step Ottawa should take if it's rious about energy conservation is to crease oil and natural gas prices enough force a cutback in industrial consump-n," the report says.

The document was prepared by Spain, weden and Belgium, three of the 17 mber countries of the international ency.

The organization, most of whose mem-rs are oil importers, was set up to velop an energy-sharing program in the ent of shortages caused by cutbacks in ports by oil-producing nations.

The Star says it obtained a copy of the nfidential report which was completed October.

In Canada's present energy conserva-n efforts, the report says, "there ap-ars to be a substantial gap between nciple and practice.

"It would appear that the central policy opted by the Ottawa cabinet has not yet oved strong enough to get rapid deci-ns," the report says.

'That is," it continues, "the cabinet pears to have accepted the goal of nservation without recognizing the need implement the goal with specific tions."

Canada's energy conservation efforts rated 10th among the agency's 17 mber countries.

Dealing with the nation's current poli-s on oil and natural gas pricing, the ort says the gap between Canadian energy prices and world prices would appear too big.

"The reviewing team," the report says, "was skeptical about the impact of pricing policy . . . in terms of securing a meaningful contribution from the industrial sector."

And it also suggests that more needs to be done to get Canada's provinces behind federal conservation programs.

Cass-Beggs steps down

James Rhodes, president of the British Columbia Petroleum Corp., has been appointed chairman of B.C. Hydro, the province's biggest crown corporation.

He succeeds David Cass-Beggs, 67, who said last July that he intended to step down sometime during 1975.

Energy-conscious town

Davis, California, city council has approved a novel building code designed to save owners of new homes close to 50 per cent on their heating and cooling bills.

The new building code requires that all new houses built in this Sacramento Valley university town be designed to harmonize with the local climate in order to achieve maximum energy efficiency.

Davis is believed to be the first town in the United States to pass such an energy-conscious building code. Authors of the regulations say that construction costs will be somewhat higher — up to $500 — than the cost of conventional homes, but that substantial savings will be realized in the long run.

And they add that the new homes in Davis will look no different than the older ones.

The program will provide for two approaches to energy conservation, the first a new standard building code that will require that buildings meet minimum insulation standards, have light-colored roofs, and have windows that are limited in size and positioned to make the best use of the sun.

Windows will also have to be shaded in the summer with tree shrubs, overhangs or shutters.

The program's second approach to conservation allows a builder to use any design he wants as long as he meets a minimum standard of energy efficiency calculated in units of heat loss in winter and heat gain in summer

A spokesman for the program's authors says that despite the mild climate in Davis, the town was 30 per cent above the national average in its per capita consumption of gas and electricity.

Jonathan Hammond says during the summer months the average daily temperature can be 35°C and higher, "but the nights are cool because of an ocean breeze that literally sweeps inland after funneling past the Golden Gate bridge in San Francisco.

"However, we can use this to advantage at night," he says, "by providing Davis houses with good ventilation systems and uncarpeted cement slab floors to store the cool night time air."

Sold on street cars

Most of a group of a dozen Metro Toron politicians and civic officials have returne from a European fact-finding mission and have returned home sold on the street car as the answer to much of the city's future transit needs.

The group included Metro chairman Paul Godfrey and Scarborough mayor Paul Cosgrove, who said in Rotterdam that he could "sell the light rail transit (LRT) line proposed to link Scarborough Town Cen-

tre with the Danforth subway at a council meeting tomorrow."

Mr. Cosgrove said he was "worried about environmental problems and potential roadblocks. But having seen what they've done here with quiet street cars on 66-foot road allowances, I believe we can do it practically, economically, and on a human scale."

Mr. Godfrey said he had "nagging doubts" that his interest in street cars had been something he had convinced himself of because of their lower cost compared to subways.

"Now I'm sure we're going the right route. Any new concept is going to be looked at by the public with a jaundiced eye but I know we can build an efficient LRT line that will serve people's needs while sufficient care can be taken to ensure the environmental impact is minimal."

In Rotterdam, in particular, fears about adverse public reaction to street cars were stilled when the group rode a line passing within 50 feet of substantial suburban homes which have, reportedly, increased in value because of the street-car service.

Says Samuel Cass, Metro roads commissioner, the trip "reinforces the gut feeling I've had that we need wide rights-of-way, not just for cars, but for everything.

"From what we have seen, it is almost as if the old world has become modern and the new world has gone old-fashioned," he said.

In a goldfish bowl

Ontario Hydro, by popular demand, is operating in a fish bowl with every decision — whether business or technical — subject to public scrutiny and open hearing, says the utility's vice-president distribution, Henry J. Sissons.

Mr. Sissons told the Electric Club of Toronto that "the problem is that the water in that fish bowl is growing increasingly cloudy.

"Because of the cross-currents in public attitudes," Mr. Sissons says, "the fish — we at Hydro — are no longer sure of the direction in which we should be swimming."

Interconnection pact

Manitoba Hydro and Northern States Power Company, of Minneapolis, have agreed in principle to build a major interconnection between the two utilities.

A letter of intent signed by both utilities provides for construction of a 500-kV line between Winnipeg and the Minneapolis area.

Scheduled for completion by 1980, the line and terminal stations are expected to cost about $200 million, of which Manitoba's share would be about $50 million.

municipal briefs

Meaford PUC has named veteran office employee Vern Ashby its office manager and secretary-treasurer and Harry Jones its line superintendent, on a temporary basis. The positions were created with the resignation of former manager Roy Bishop who is now manager of Port Colborne Hydro.

Well-known community leader, John C. Halliday, who served on Thorold's PUC for 30 years — several as chairman, has died at the age of 90. A native of Scotland, he was first chairman of the Thorold high school board and was appointed a justice of the peace for the town in 1953, and for the province in 1961.

One of the better known names in municipal electrical utilities circles in the province, Percy R. Locke, of St. Thomas, has died at age 75. Mr. Locke was a member of St. Thomas PUC for 33 years and served as its chairman for a decade. Mr. Locke was 1962 president of the OMEA.

C. W. (Bill) Dukelow, the Electrical Utilitie Safety Association's assistant gener manager for the past 13 years, has die Mr. Dukelow had been with EUSA for years, the first five of which were as a fie safety supervisor in the province's easte region.

London PUC has contended in a submi sion to the city's 11-member City of Lo don management committee studying th municipality's organization structure th the utility should not be changed just "f the sake of change." The utility said it ha provided efficient service to the city populace since its inception.

Brockville PUC's protracted, sabotag ridden strike has finally ended with a 34 per cent pay increase to the 24 strikir employees. The agreement will give con mission linemen, the top hourly-rated en ployees, more than $16,700 a year, star ing April 1.

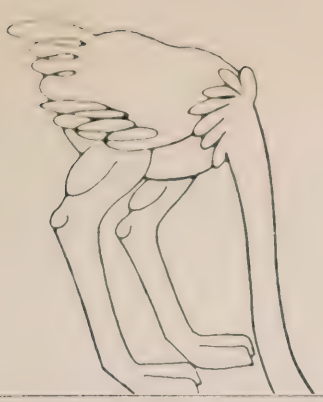
Scarborough PUC lineman John Marc ment, 35, recently received three separa awards for saving the life of a 70-year-o man — a plaque from the PUC, anoth from a safety association, and a set Olympic coins and a certificate from h union.

London's oldest fire hall may become storage depot for London PUC. The city board of control has offered to lease th station to the utility for $1 a year.

Iroquois Reeve Lloyd C. Davis has bee presented with a set of silver cufflinks commemorate 25 years' service to th local Hydro commission.

West Lorne PUC's former manager, Ke Phoenix, has been presented with a gol watch to pay tribute to his three decade of service to the utility.

Chatham's former mayor and former PU chairman, Archie Stirling, has died at ag 86. Mr. Stirling was long active in Ontari baseball circles and in local politics for 5 years, but it was as "Mr. Baseball" he wa affectionally known around the city.



as don wright saw it

Writing obits is a task usually assigned to the greenest of young reporters and yet we are finding this assignment particularly difficult. Perhaps this is because we are writing our own, so to speak, and with our intimate knowledge of the deceased we find it almost impossible to eulogize.

We have also written a coroner's report on page one of this final issue just to explain how the death of Hydro News led to the end of this column and not vice-versa as most readers will have assumed. Admittedly, this remained a distinct possibility right up to the end.

But back to the eulogy. They laughed when we sat down to type way back in the days when rate increases were a rarity and hopefully we have managed to elicit a mild guffaw or two in the 100 or so columns that followed.

Glancing through back issues is like taking a course in contemporary history, where one can excuse the contradiction, where the significant developments of an event-filled decade are artfully identified and shrewdly analyzed. The obvious we left to others in order to concentrate on those apparently insignificant events which, in the aggregate, shape our times.

Admittedly, many of these apparently insignificant events turned out to be just that. With the benefit of hindsight we might, for example, have placed less emphasis on an electrical device brought out by the British to prevent snoring, drinking and carrying on with the neighbor's wife as reported June, 1967. Evidence now available suggests that some of these things are still going on.

Science was perhaps the area of our greatest strength and it was always a pleasure to acquaint readers with the important work being carried out for the benefit of humanity in obscure laboratories throughout the world. There is a list of subjects as long as your arm upon which we were among the first to discourse including the advent of the plastic cud for cows, the use of chicken manure to propel automobiles and the horticultural benefits of conversing with petunias.

And as a kind of going away present we might just mention another intriguing breakthrough which might otherwise have gone unnoticed due to the modesty of the scientific community. It has to do with tickling oneself and was originally reported by a profound journal of science. According to this report it has been irrefutably established, through experiments with an apparatus called a tickling box, that a self-administered tickle is less effective than an externally-administered tickle.

We have neither the time nor the resources to fully explore the significance of this work but if you intend to tickle effectively it seems safe to assume that you must do so on somebody else.

In the past columns we have also had quite a bit to say about water closets and as a result have established some small reputation as an expert. So much so, in fact, that we promised to leave the john entirely alone in favor of more edifying subjects. But the situation has changed now and it would be less than fitting if we were to depart without one last tug on the chain.

And we do have an important item. Only recently have we been able to identify the man whose mechanical genius and general benevolence led to the loo as we know it today. He was an Englishman of Queen Victoria's era and his early experimental models bore such gushy names as the Torrent and the Deluge.

For some inexplicable reason he was never knighted but he was appointed Royal Plumber to Edward VII as both Prince of Wales and King. His name? It was Thomas Crapper.

As a former editor of Hydro News, we found that writing heads for the various articles was always a challenge and inspiration came to us on a few rare occasions. The one we like best headed a story about the production of cheddar cheese in Ontario. Among other things, the article described the economic benefits of the cheese industry to the province. We dubbed it "What A Friend We Have in Cheeses."

Perhaps the closest we ever came to self destruction was in lampooning the office memo. In this instance we suggested that memo writing was an art in itself which, properly developed, could result in meaningless communication so profound as to assure the author of a job in perpetuity. How can you fire a man who has gone consistently to paper, we asked, simply because you are too dense to understand his memos?

We were the recipient of baleful glances from a number of executives after that one but paper consumption was said to have dropped by 50 per cent for quite some time.

Skating on thin ice is also an art in itself and we think it speaks well for management that we have been able to practise it with a considerable degree of latitude. Even such sancrosanct and sepulchral subjects as pollution, rising costs and committees of enquiry have been dealt with here in less than reverent fashion. Credibility is one of the most elusive and important elements of communications and an organization which is not above seeing the funny side of its problems is demonstrating a willingness to tell things like they are.

Whatever the value of our dissertations over the years, we hope they have been useful as a sugar coating in helping readers to swallow ever-increasing doses of bad news. We remain convinced that the gravity of the situation need not be reflected in the length of the corporate mien and write -30- to our meanderings with a full appreciation of the freedom we have enjoyed to pontificate upon subjects not normally considered grist for the humorist's mill.

As for our vast horde of avid readers we can probably reach the great majority of them with one simple farewell: thank you mother and kind old Aunt Isobelle.□

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